

**BLACK+DECKER**

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# DIY ROOFING



Shingles • Shakes • Tile • Rubber • Metal • PLUS Roof Repair



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# Contents

## Introduction

## ROOFING

Evaluating Your Needs

Choosing Roofing

Estimating Roofing

Working Safely

Roof Systems

Tools & Materials

Completing the Tear Off

Replacing Sheathing

Underlayment

Drip Edge

Asphalt Shingles

Ridge Vents

Cedar Shakes

Roll Roofing

EPDM Rubber Roofing

Raised Seam Metal Roofing

Faux Slate

Tile Roofing

Inspecting & Repairing a Roof

## FLASHING, SOFFITS, FASCIA, GUTTERS & VENTS

Flashing

Soffits & Vents

[Aluminum Soffits](#)

[Aluminum Fascia](#)

[Wood Soffits](#)

[Repairing Wood Fascia & Soffits](#)

[Gutters](#)

**[Resources](#)**

**[Photo Credits](#)**

**[Index](#)**



## Introduction

There is a comforting sense of security in having a solid, reliable roof over your head. It's what separates a well-built home from lesser structures and more uncomfortable residences. But roofs, and their components, don't last forever. The roof on a house is a complex construction with many points that can fail and potentially compromise the entire structure. That's why understanding how a roof is put together—including the essential role that flashing, gutters, and ventilation elements play—is so important. Whether you're putting on a new roof or just fixing a small problem so that it doesn't become a bigger issue, *BLACK+DECKER DIY Roofing* will help you build the skills you need and get the job done with the bare minimum of effort and expense.

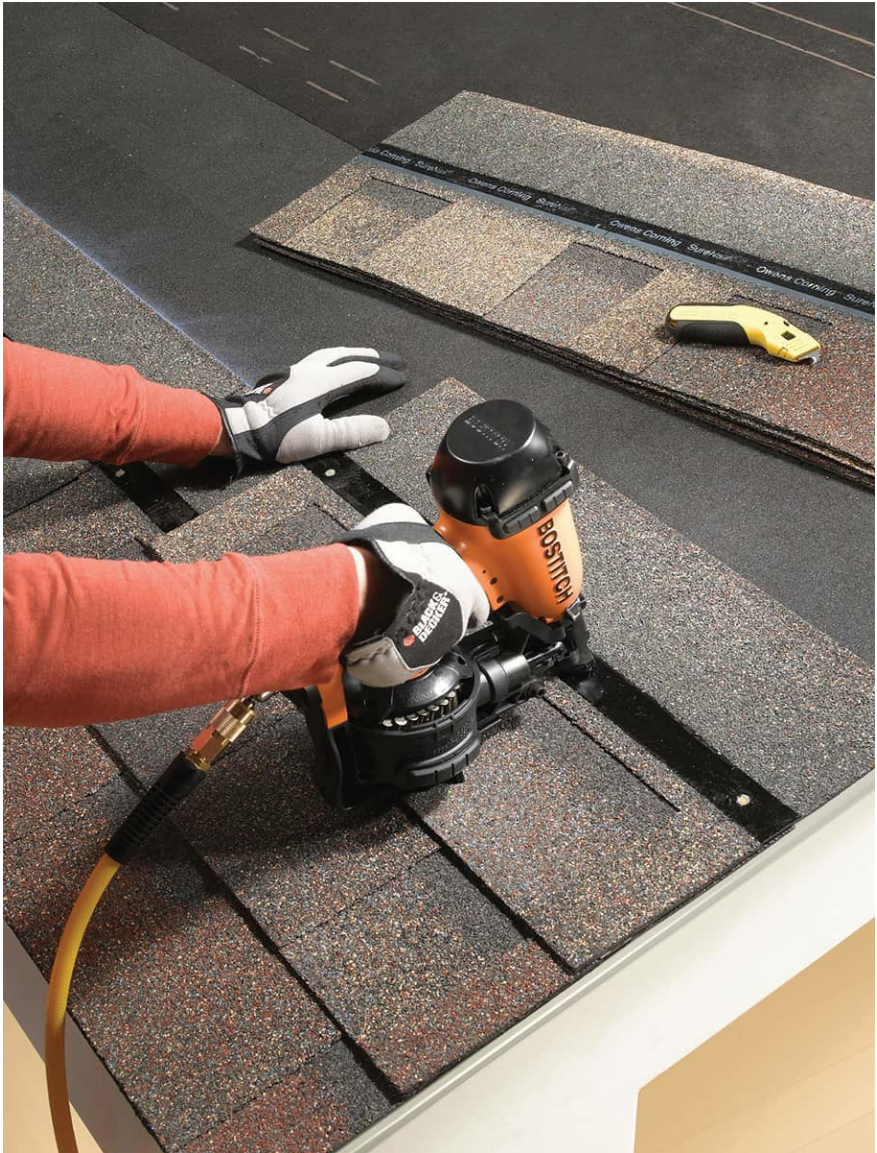
Every roof shares a very basic purpose: to protect the rest of the home's structure and the occupants within it from the elements. But beyond that, any given roof can be very different from the surface on top of a neighbor's house. To start with, there is an amazing diversity of roofing materials. The options range from asphalt to clay to rubber and beyond. Each comes with its own benefits and down sides, but there is usually one roofing material that is ideal for your home and your budget. That choice has to take into account economics, longevity, local codes, the architectural style of your home, and your own aesthetic preferences. Suffice it to say, if



you're thinking about replacing your old roof or need to install a new one on the home you're building, all the variables can be downright confusing. Take heart; you'll find professional guidance in this book in the form of insight and advice directing you to the ideal choice for you and your particular circumstances. You'll also find information on the technologies, such as photovoltaic shingles.

In addition, we've included a wealth of information covering the many components that make up a roof and how they work together. Once you understand how a roof does what it does, replacing roof tiles, shakes, or shingles, repairing flashing, fixing gutters, or even ripping off a roof and replacing it entirely becomes a realistic DIY project—even more so these days, given that manufacturers continue to simplify the processes necessary for installing their products.

The key to doing anything involving a roof is to take it slowly, double-check measurements, and be careful with everything you do—not least because safety is so important when working high up on a slanted surface. With this book, attention to detail, some hard work, and a friend or two, you can have a new roof for a fraction of what a professional would charge you.





## Roofing

The pages that follow will help get you started on the right foot with your roofing project. You'll begin the planning process by evaluating your needs and estimating the material quantities required, the cost, and roughly how long the project will take. Then, you'll take a more in-depth look at the wide variety of product options available.

Safety is an issue with a roofing project. You'll learn important tips for working safely, how to set up ladders, and how to prepare your job site to minimize damage, manage debris, and work efficiently.

The right roofing material for your home is one that looks great, is within your budget, and offers maximum longevity with the least amount of maintenance. Many homeowners opt to simply replace their roofing with the same type—often the most sensible choice. However, if you'd like to change the look of your home or upgrade to a longer-lasting material, you'll find plenty of options.





In this chapter:

- Evaluating Your Needs
- Choosing Roofing
- Estimating Roofing
- Working Safely
- Roof Systems
- Tools & Materials
- Completing the Tear Off

- Replacing Sheathing
- Underlayment
- Drip Edge
- Asphalt Shingles
- Ridge Vents
- Cedar Shakes
- Roll Roofing
- EPDM Rubber Roofing
- Raised Seam Metal Roofing
- Faux Slate
- Tile Roofing
- Inspecting & Repairing a Roof



## Evaluating Your Needs

Even if you choose to tackle it yourself, installing a new roof is a major financial investment. You'll find it worth your while to study the many material options. If you do choose to stick with the type of roofing you currently have, you may find an attractive or efficient upgrade in profile, color, or durability.

If you are considering a new type of roof covering, check out the following pages. You'll find a wide range of attractive roofing options that offer some good ways to enhance the look of your home. Bear in mind that while roofing has the all-important function of protecting your home from rain and snow, it has a decorative role as well. A roof packs a lot of visual wallop, making up about a third of a home's façade on average. Neutral colors are a good choice if you are likely to alter the color scheme of your siding and trim. Generally light-colored roof coverings are more energy-efficient, and some government programs offer financial incentives for selecting light-colored shingles.

The architectural style of your home will seldom limit the choice of roofing material. With the exception of clay tile roofing and some cement tile options that tend to look best on Southwestern- and Mediterranean-style homes, the range of roofing materials can suit almost any home. And roof coverings can be combined. For example, standing-seam metal roofing can top off a bay or bow window for an elegant feature that complements standard asphalt shingles on the main roof deck.





**Your roofing serves two fundamental roles:** protecting you from the elements and boosting the attractiveness of your home. For visual variety, you might choose standard asphalt shingles for the bulk of the roof, but add a premium touch such as metal roofing above a bay window.



## Identifying Roofing Problems



Ceiling stains show up on interior surfaces, but they're usually caused by leaks in the roof.





When shingles start to cup or show signs of widespread damage, they need to be replaced.





Loose flashing can be caused by external forces, such as high winds, or by the failure of the sealant or fasteners. The flashing can sometimes be repaired or replaced without replacing the shingles.





**Damaged and deteriorated flashing can cause roof leaks. The damaged piece or pieces need to be removed and replaced.**



## Choosing Roofing

With so many options, choosing a roofing material for your home can seem like a daunting task. Appearance, cost, ease of installation, lifespan, value, and maintenance all play a role.

**Style:** After you've narrowed your decision down to a type of material, you'll need to choose a style and color. You have quite a few options; even basic asphalt shingles are available in a seemingly endless number of colors. Styles include three-tabs, textured, and scallops.

Architectural features of your house, including the existing materials, can help in your decision making. Stucco siding and clay roofing are a natural fit, especially for a Spanish, Mediterranean, or Southwest styling. Brick siding and metal roofing make a pleasing contrast. Slate (real or faux) is an ideal complement for more traditional homes.

Because roofing lasts for decades, you'll be living with your decision for a long time. Be thorough in looking at different products, weighing their advantages and any disadvantages, before finalizing your decision.

**Price:** Prices are as varied as the roof-covering products themselves and can differ from region to region. For example, slate is a relatively accessible roofing material in Vermont where it is quarried but a luxury roofing elsewhere because of its high shipping cost. Cedar shingles and shakes are more expensive in the Northeast than in the Northwest, again due primarily to shipping. However, slate, clay, and copper are generally the most expensive roofing products, followed by concrete tiles, metal, cedar shakes and shingles, organic asphalt, fiberglass asphalt, and roll roofing. If you are married to a particular look but can't afford the real thing,



consider less expensive substitutes. The look and features of many premium roofing products are now replicated in other materials. Some metal roofs have the profile of tile, and some asphalt shingles look like the higher-priced wood shakes.



**Architectural asphalt shingles** are the most cost-effective option for adding visual interest to your roof. They are available in a wide range of colors and textures, many of which hide minor installation flaws.



## ROOFING PRICE COMPARISON

### LEAST EXPENSIVE

Asphalt

Roll roofing

### MOST EXPENSIVE

Slate

Clay

Copper

### MID RANGE

Concrete tiles

Metal

Cedar shakes/shingles

Self-adhesive roll roofing



## ADD UP THE EXTRAS

When determining the cost of your project, consider everything you'll need to complete the job, including roofing, flashing, trim, fasteners, and any underlayment necessary for repairs. Don't forget the cost of disposal in the case of a tearoff and the plastic tarps for protecting plantings. Should you choose to upgrade to a heavier roofing material such as concrete tiles, clay, or slate, you may have to bolster rafters as well—a pricey proposition.





## Durability

In general, maintenance for roofing materials is fairly minimal. On shaded roofs, moss should be kept under control. Any buildup of leaves and fir needles in valleys should be removed to prevent ice dams. Most non-scheduled maintenance is the result of damage to roofing components, such as torn or cracked shingles or loosened metal flashing. Individual asphalt shingles may be damaged by wind or fallen limbs and wooden shakes or shingles may crack and loosen, in which case they can be re-nailed or replaced. Roll roofing can develop blisters or small holes, which can be repaired with roofing cement. Metal, tile, and clay roofs need only minimal maintenance.

Consider the lifespan of the products that you want to install on your roof. Some materials are extremely durable and guaranteed to last 50 years or more, while others may need to be replaced in less than 10 years.

Climate influences product longevity. Long winters with many ice and thaw cycles take their toll on roofs, and so does intense wind. Even intense sunlight is a factor; often a south-facing roof deteriorates more quickly because it bears the full brunt of the sun and its UV radiation for much of the day.

Roof pitch also affects product lifespan. Generally the higher the pitch, the less the likelihood of wind, snow, and ice damage. Flat roofs are more susceptible to damage from falling branches or ice. Standing water is almost inevitable on flat roofs, often turning minor points of weakness into major problems. Keeping nearby trees trimmed back lessens moss buildup and the hazard of damage due to falling limbs.

Wood shakes are available in different durability grades. Top-quality shakes carry 50-year warranties, while the lower-end shakes are rated to last about 30 years. The lifespan of asphalt shingles also varies. They should last a minimum of 20 years, with the thicker, more durable architectural shingles lasting another decade or more. Roll roofing has the shortest life span, lasting between 6 and 12 years. Metal roofs, despite their light weight, are remarkably durable. Warranties vary by product and manufacturer, but warranties for metal roofing of 30 to 50 years or more are typical.



**Durability** does not necessarily come with a high price tag. Concrete tile roofing is less expensive than slate or real tile but offers the same benefits of long life, fire resistance, and a premium appearance. Along with concrete, clay tile and slate are the most durable roofing products.



Shakes made of vinyl provide the look of hand-split cedar shakes without the maintenance required for real wood. They're especially suited to damp climates where moss can damage wood shakes.



## Asphalt Three-Tab Shingles

Asphalt three-tab roof shingles consist of a sandwich of asphalt and fiberglass or felt layers covered by mineral granules. For several important reasons they've been the dominant roofing option in the United States for more than a century. Weighing 2 to 3 pounds per square foot, asphalt shingles are relatively lightweight compared to slate, clay, or cement tile. Any pitched roof that's suitable for shingling (a 4-in-12 slope or greater) and properly constructed can accept asphalt shingles without further reinforcement.

Asphalt three-tabs are reasonably priced, and you can expect them to last about 20 years, depending on the quality of the shingle and the intensity of the local climate. Installing or repairing asphalt shingles isn't difficult; in fact, it's the most approachable roofing material for do-it-yourselfers or any qualified roofing installer. Ease of installation also helps keep costs down. Once installed, high-quality asphalt shingles are relatively maintenance free and offer good fire and wind resistance. They come in a wide range of colors to blend in nicely with any siding and trim color scheme. If you live in a damp or coastal environment, you can also find asphalt shingles impregnated with algaecides to prevent staining.





The most common roof covering by far, asphalt three-tab shingles are inexpensive, lightweight, and available in a wide range of colors and styles. They are also easy to install, require few tools to do it, and are do-it-yourself friendly.







## ASPHALT SHINGLE TYPES

Asphalt shingles are usually rated by lifespan, with 20-, 25-, and 40-year ratings the most common (although some now claim to be 50-year shingles). Functionally, these ratings should be used for comparison purposes only. For example, asphalt shingles on a low-pitch roof in a hot climate might fail in as little as 12 years.

The term “multitab shingle” refers to any asphalt shingle manufactured with stamped cutouts to mimic the shapes of slate tile or wood shakes. Multitab cutouts are made and installed in single-thickness, 3' strips, so these tabbed reveals show up. The ubiquitous term for them is “three-tab,” but two- and four-tab styles are also available. Generally, the tabs are spaced evenly along each sheet of shingle to provide a uniform appearance and a stepped, brick-laid pattern on the roof. However, some manufacturers also offer styles with shaped corners or randomly spaced tabs trimmed to different heights for a more unique look.







## Laminated Asphalt Shingles

Laminated asphalt shingles are an increasingly popular option for new homes or roofing replacements. You may also hear them referred to as “dimensional,” “architectural,” or “multithickness” shingles. Essentially, laminated asphalt shingles have the same material composition as multitar cutout shingles—a sandwich of asphalt, base sheeting of felt or fiberglass, and granular coatings. However, the important difference is that instead of a single shingle layer, two layers are bonded together to create a three-dimensional appearance. The top layer has wide, randomly sized notches, and it overlays a staggered, unnotched bottom layer. The effect of this lamination treatment helps mimic the natural inconsistencies of a cedar shake or slate roof.

Laminated shingles are no more difficult to install than three-tab shingles, and the same installation methods apply. The random pattern can even reduce overall installation waste because the pattern is more visually forgiving than the uniform design of three-tab shingles. Sections of shingles that would otherwise interrupt a three-tab pattern can still be used in a laminated shingle installation.

The added shingle layer makes laminated shingles heavier than standard three-tab shingles, but the weight difference isn’t critical; any pitched roof can accept them without special structural reinforcement. Laminated shingles are also thicker than multitar shingles, which gives them improved wind resistance and durability. As you might expect, they’re more expensive than three-tab shingles. The added thickness enables manufacturers to offer longer 30- to 50-year warranties, which can make them a better investment than three-tab shingles over the life of your roof.





**Architectural shingles** (also called laminated and dimensional) are installed very similarly to regular three-tab asphalt shingles, but they offer a more sophisticated appearance with greater visual depth (inset). They also come with longer warranties than comparable three-tab shingles. They're easy for homeowners to install, only marginally more difficult than standard three-tabs, and require only basic tools.





## Asphalt Roll Roofing

For low-pitched roofs, or in cases where budgetary concerns are more important than appearance, rolled roofing might be the perfect choice for your situation. Roll roofing is also a good option if you need to cover a roof for an extended period but plan to install the final roofing at a later date.

Think of asphalt-and-granule roll roofing as continuous strips of asphalt shingles without the tab cutouts. Roll asphalt roofing is installed in overlapping layers just like asphalt shingles, but the amount of exposure from one layer to the next is much greater than it is with roll shingles. Depending on the product, asphalt roll roofing will either be entirely covered with granules and installed to provide a single layer of coverage, or only half the sheet will be covered in a granule layer. The uncoated half (called a selvedge edge) and half of the shingle layer above it are covered with roofing cement for an improved seal. The wider overlap provided by the selvedge edge lends a double-coverage effect. (Double-coverage roofing is rapidly becoming rare.)

Single-coverage roll roofing may also have a selvedge edge for cement, but it will be only a few inches wide. Single- and double-coverage styles are secured with roofing nails around the edges. Both types are suitable for do-it-yourself roofing.

New self-adhesive products have lifted this type of roofing out of the bargain basement. Made of two layers—a base layer covered by a granule-coated top layer—these products install much like an ice and water shield and offer better appearance and increased longevity. The adhesive is fierce, all but eliminating any tendency to blister. Because of the adhesion and two-layered installation, manufacturers warranty the material for 15 years. Most manufacturers of standard roll roofing offer no warranty at all.





**Roll roofing** is essentially building paper with a granular surface coating. Single-coverage roll roofing is typically installed in a perimeter bond application with an overlap of about 6". Self-adhesive ice and water shield is a roll roof product that is installed under the first few courses of shingles to prevent leaks from ice dams. Self-adhesive roll roofing has two layers and offers better longevity than typical roll roofing.



Roll roofing

Ice and water  
shield

Self-adhesive  
roll roofing





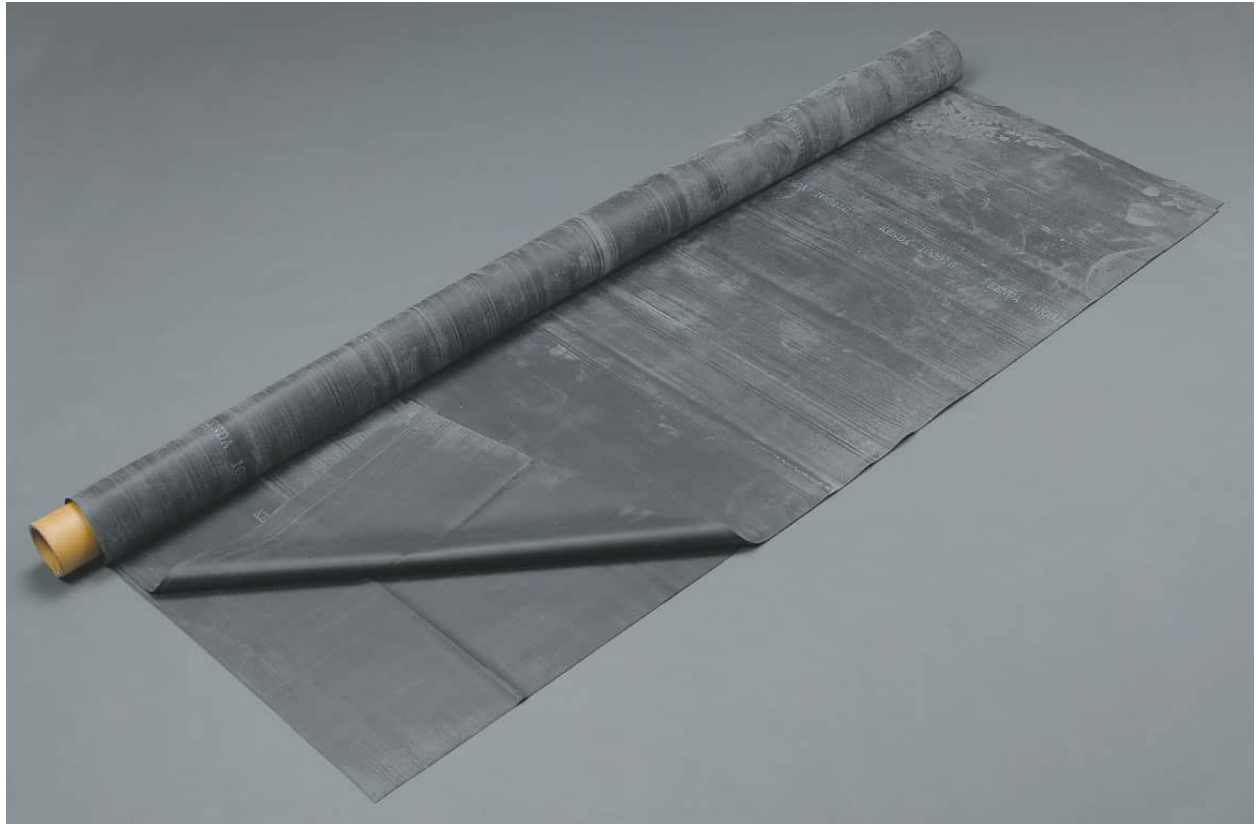
## EPDM Rubber Roofing

Rubber membrane roofing, also known as ethylene propylene diene monomer (EPDM) roofing, is installed in wide sheets using a specialized latex bonding adhesive, but it is not nailed in place. Rubber roofs for home use are almost always fully bonded to the roof deck with cement. The absence of nails make it an even better choice for low-pitch roofs that are susceptible to leaks. You may choose to install a rubber membrane on a pitched roof simply because it is seamless and easy to install.

The membrane is available in 10- or 20-foot-wide rolls to help reduce the total number of seams. Common thicknesses are 45 and 60 mil (.04 and .06 inch). In recent years, EPDM membrane has become more do-it-yourself friendly, and it's available to consumers through roofing suppliers and some home centers. It is comparably priced to quality asphalt shingles. For heat reflection and an added layer of protection, some homeowners opt to add gravel ballast or, if the structure can bear it, concrete pavers.



**Rubber membrane roofs** used to be installed almost exclusively in commercial situations, but DIY-friendly versions have become common in recent years. They're an excellent choice for flat or near-flat roofs. The rubber material is sold in prepackaged rolls (50' and 100' are common), or you can buy it by the linear foot from some roofing material suppliers.







## Slate Shingles

Slate roofing has been around for centuries, and it's one of the most weather-resistant and beautiful options you can put on your roof. It is quarried and cut into thin individual shingles and installed with nails. Natural variations in color and texture give slate an organic quality that is unmatched by synthetic roofing products.

However, despite its visual appeal and long-lasting performance—more than 100 years in many cases—a number of important factors may make slate unfeasible for your home. For one, slate is heavy, weighing about twice as much as asphalt singles per square foot. It's also about triple the cost of premium asphalt shingles. A conventionally framed or truss roof may require additional framing before it's suitable for slate shingles. Check with a structural engineer to see if your home's roof will support slate.

Installing slate shingles involves the use of specialized cutting tools and skills, which makes it extremely complicated to install for do-it-yourselfers as well as many roofers. Once installed, slate's durability to the elements doesn't extend to foot traffic. The shingles are brittle and can break if they are stepped on. Replacing broken shingles involves installing extra staging and ladders to prevent further damage, and removing individual shingles is a complicated process.



Slate roofs are expensive and not DIY-friendly, but for overall attractiveness and durability, they're hard to beat. Due its longevity, slate requires premium flashing materials and careful installation.







## Clay Tile

Clay tile roofs are common on southern and coastal homes, where intense heat and high winds are a concern. Since clay is a manufactured product, roofing tiles are available in a wide range of shapes, sizes, and colors. Clay tiles offer excellent durability and fire resistance. However, clay is slightly heavier than slate, and installing it over typical roof framing may require adding structural reinforcements. Of course, this adds to the project costs.

Depending on the region in which you live, there may be many qualified roofers who can install it properly. Working with clay tile requires cutting with a diamond-blade saw, and it may not be suitable for complex roof designs. It is also relatively fragile and cannot be walked on, so repairs can be difficult. The installed cost of clay tiles is comparable to slate. On all but the most basic roof designs, clay tile is not do-it-yourself friendly.



Clay tile roofs have a distinctive regional appearance, but they can be installed in practically any climate. They're heavy and relatively expensive. Most clay tiles have a half-pipe shape and terra-cotta color, but with a little research you can find a rather wide range of colors and styles. Due to its weight and unique method of installation, clay tile is a challenging material for a do-it-yourselfer.







## Concrete Tile

Concrete continues to grow in popularity as a roofing material. That's not surprising, given that the right formulation in a roof tile provides superior wind, hail, and fire resistance, with a life to rival much more expensive clay or slate tiles. Contemporary concrete roofing tiles are produced in an impressive range of surface shapes and appearances, some mimicking other materials. Some manufacturers even offer concrete tiles that look convincingly like wood.

As you would expect, concrete roof tiles are heavy. They weigh a bit more than slate tiles do and about the same as a roof built of clay tile. However, modern versions are often fortified with wood fibers, composites, or polymers to cut down on the overall weight and put less stress on the framed structure—all without compromising durability. Concrete tiles offer the same performance as slate or clay tiles, with a significantly lower installation cost—roughly half the price of a roof made of slate.



Fiber cement is growing quickly as a concrete roofing tile material, much as it is for lap siding. It offers a singular package of durability, low maintenance, beauty, and reasonable cost. Cement tiles and fiber-cement tiles usually have a simulated wood grain appearance to resemble wood shingles, but concrete tiles are available in many other styles. Though heavy and challenging to cut, concrete tiles are straightforward to install.







## Metal Roofing

Metal roofing has proven its durability as a residential roofing material for centuries in Europe, but until recently it was more common to see a metal roof on an agricultural or commercial building than on a home here in the States. That trend is quickly changing. Advances in metal-forming techniques and improvements in coatings have created a wide variety of styles and colors to choose from, making metal roofing a more enticing option for homeowners. In fact, metal roofing is the fastest-growing segment of the residential roofing products market for several reasons. For one, metal is the lightest-weight roofing material made. Because metal roofing weighs less than most other roofing materials, any standard-framed roof can support it. Provided the shingles are in sound condition and local building codes permit it, metal roofing can even be installed over a layer or two of asphalt shingles. This saves on the cost and effort involved with a tearoff.

Metal offers excellent wind and fire resistance, and improvements in rust-inhibitive coatings make it weather well for many decades. It resists peeling, chalking, and fading from UV light. Metal roofs are quite common in coastal areas that are subjected to tropical storms and high winds. They also perform favorably when subjected to heavy snowfall or ice accumulations.



**Standing-seam metal roofs** are lightweight, very durable, and only moderately expensive. Typically, they are fabricated on-site by pros, but some prefabricated panel systems are DIY friendly. Installing metal roofing requires metal cutting skills and the selection of a product that doesn't require special installation equipment.



Unlike wood or asphalt roofing, metal will not rot, crack, or promote algae growth, so it is largely maintenance free. Light-colored metal roofs, which reflect sunlight instead of absorbing it, offer energy-saving benefits as well. Attics stay cooler in summer months, which reduces energy costs. Given its durability, warranties in the 30- to 50-year range are common for



professionally installed metal roofing systems. In terms of cost, metal is more expensive than premium asphalt shingles but cheaper than slate or clay.

Residential metal roofing is available in steel, aluminum, or copper. It is embossed in several surface textures to simulate clay tiles, wood shakes, or asphalt shingles. Some products are coated with granules to enhance their texture. Embossed metal roofing comes in either horizontal panels with several shingles formed on each panel or as individual shake or tile shapes. Each piece has flanges that clip to the top and bottom of adjacent pieces or nail-down clips along the edges. Smooth panels with standing seams crimped or clipped together along both long edges are the most common style of metal roofing. The metal panels can be formed on location with common metalworking tools. They're also available in prefabricated panels. Copper is most often installed in panel form and left unfinished to weather to a green patina. It is the most expensive option. Steel or aluminum roofing come in a spectrum of colors to suit any siding color scheme.

There are a few drawbacks to metal roofing worth noting. It is slippery when wet, and it can be dented or scratched. Metal can be difficult to adapt to complex roof styles. Eventually steel roofing will need to be repainted to prevent corrosion.

Although it shouldn't be difficult to find qualified installers in most regions, you need special metalworking skills to tackle most residential metal roofing products yourself.



**Metal shingles** offer color, dimensionality, and long life. They install in panels one course deep and 2' to 4' long. Some types are granular coated, looking much like concrete tiles but without the added weight.



Metal roofing shaped like low-profiled tile comes not just in terra cotta, but red, blue, gray, green, and brown—a good option if you plan to make your roof a design feature of your home.





## CORRUGATED NONMETALLIC PANELS



Prefabricated panels made of metal, fiberglass, or clear polycarbonate come in standard widths and lengths and are usually installed over a system of purlins. Historically, they have been used most often to roof outbuildings and shelters, but the metal versions are becoming more popular for whole houses and room additions.



## Environmentally Friendly Roofs

A little-known but new breed of environmentally friendly roofing products is now available for residential applications. If you like the look of slate, tile, or wood shakes, you can now buy them made from blends of polymers, sawdust, rubber, vinyl, and fiberglass. These composite shingles are quite flexible, so they can withstand high winds, hail damage, or foot traffic without splitting, rotting, or breaking. Fire retarders and UV inhibitors are added to make them as durable as conventional roofing options. In polymer-based shingles, the color is blended through the material, so scratches won't show and peeling isn't a concern. Some of these alternative roofing products are made from recycled materials, such as used car tires or post-industrial waste, and the roofing may be entirely recyclable when it wears out.

Polymer or rubber composite roofing materials are heavier than metal but they are about the same weight as laminated asphalt shingles. Most come with 50-year warranties that can be transferred from one homeowner to the next. They install easily with nails over typical felt underlayment, just like asphalt shingles. You may be able to install a composite roof yourself, depending on the product.



**Green products on the roof**, as in every other part of the house, are beginning to flood the market. This welcome occurrence is creating a whole new category of options for homeowners with pro-environment priorities. Most of the newer products, such as those seen here, are made with recycled materials using composite technologies. Others, however, feature slightly older technology (see Living Roofs, next page). Local tile materials (from within a 500-mile project radius) manufactured with indigenous materials and postindustrial recycled content, including fly ash and slag, are shown here. These criteria contribute toward third-party certification and possible leadership in energy and environmental design (LEED) credits.





Fly ash



Slag



## GREEN ROOF OPTIONS

### LIVING ROOFS

Once a mainstay on the Great Plains where no other roofing material was available and only sod made sense, living roofs made of plants and planting media are well established in commercial construction and used increasingly in residential architecture. Modular systems, installed over a waterproof membrane such as EPDM, have taken much of the risk out of living roofs. Here are the benefits:

- Properly maintained, a living roof can last 50 years.
- Living roofs reduce storm water runoff, cutting waterway pollution and energy demands on sewage treatment plants.
- A living roof adds insulation, reducing heating costs and cutting cooling costs as much as 25 percent.
- Living roofs improve air quality. A two-car garage with a living roof will create enough oxygen annually to supply 25 people for a year.
- A living roof provides habitat for wildlife.
- Green roofs can host some types of vegetables for a beautiful overhead addition.





**Eco-friendliness and natural insulation** help offset the cost of a living roof. If your roof slope is slight and its framing beefy enough to stand the extra weight, you can choose from several manufactured systems to add overhead foliage to your home.

Whether you choose to add a living roof to your home or experiment with the approach on your garage, there are three primary methods of achieving a living roof. The first is to hire a design-and-build firm that specializes in the installation of living roofs; the second is to build one yourself using a proprietary kit-type system; last, you can make one mostly from products you can purchase at a home center. Here are some planning tips to consider:

- Avoid slopes greater than 2-in-12. It is possible to create a living roof on a steeper pitch, but it is much more complicated.
- Consult with your local building department and a structural engineer to make sure your roof framing is adequate to support the weight of a living roof. Depending on the growing medium and drainage method used, a living roof can add up to 100 pounds per square foot.

- Unless your current roof covering is a waterproof membrane, such as EPDM rubber (the preferred roofing) or bonded PVC sheets, you will need to reroof.
- Are you comfortable working at heights? You will need to do occasional weeding and replanting, and unless you choose drought-resistant plants, you may need to water as well.

## PHOTOVOLTAIC SHINGLES

If you aren't ready for something photosynthetic on your roof, how about something photovoltaic? Until very recently, if you wanted to put your roof to work generating power, you had to tolerate clunky—and expensive—solar panels. Other options, such as flexible photovoltaic strips on flat or metal roofs and solar panels roughly as thick as concrete tiles, were good first steps, but new integrated photovoltaic shingles are truly suited to a roof on any suburban cul-de-sac. Melded into asphalt roofing (they almost disappear on a black roof), photovoltaic shingles protect you from the elements while feeding electricity into your house. Thin and flexible, much like asphalt three-tabs, they nail in place, each subsequent course covering the nail heads of the previous course. As they are installed they link together with built-in plugs. The shingles are tough enough to withstand a hammer drop, as well as rough weather.

The estimate for a full roof of photovoltaic shingles can be a bit daunting, but keep in mind that the total amount can be cut down considerably by federal tax credits, as well as state and local incentives. Those can add up to a savings of half the cost of the roof or more. And better yet, once the roof is installed and producing electricity, it can potentially produce half to three-quarters of the energy your household uses, depending on your family's usage pattern, your appliances, and the sun exposure the surface area of the roof receives.

These are the early days for this technology, and you may want to wait until this approach has proven itself. But for simplicity and integrated appearance, this system is well worth watching.



## Estimating Roofing

**R**oofing materials are ordered in squares, with one square equaling 100 square feet. To determine how many squares are needed, first figure out the square footage of your roof. The easiest way to make this calculation is to multiply the length by the width of each section of roof, and then multiply the numbers.

For steep roofs and those with complex designs, do your measuring from the ground and multiply by a number based on the slope of your roof. Measure the length and width of your house, include the overhangs, then multiply the numbers together to determine the overall square footage. Using the chart below, multiply the square footage by a number based on the roof's slope. Add 10 percent for waste, then divide the total square footage by 100 to determine the number of squares you need. Don't spend time calculating and subtracting the areas that won't be covered, such as skylights and chimneys. They're usually small enough that they don't impact the number of squares you need. Besides, it's good to have extra materials for waste, mistakes, and later repairs.

To determine how much flashing you'll need, measure the length of the valley to figure valley flashing, the lengths of the eaves and rakes to figure drip edge, and the number and size of vent pipes to figure vent flashing.





Asphalt shingles come in packaged bundles weighing around 65 pounds each. For typical three-tab shingles, three bundles will cover one square (100 sq. ft.) of roof.



## CONVERSION CHART

SLOPE	MULTIPLY BY
2-in-12	1.02
3-in-12	1.03
4-in-12	1.06
5-in-12	1.08
6-in-12	1.12
7-in-12	1.16
8-in-12	1.20
9-in-12	1.25
10-in-12	1.30
11-in-12	1.36
12-in-12	1.41



Calculate the roof's area by multiplying the height of the roof by the width. Do this for each section, then add the totals together. Divide that number by 100, add 10 percent for waste, and that's the number of squares of roofing materials you need.





## Measuring and Planning



Calculate the slope of your roof before beginning any roofing project. Roof slope is defined as the number of inches the roof rises for each 12" of horizontal extension (called the "run"). For example, the roof shown here has a 5-in-12 slope: it rises 5" in 12" of run. Knowing the slope is important when selecting materials and gauging the difficulty of working on the roof. To ensure safe footing, install temporary roof jacks if the slope is 7-in-12 or steeper. Roofs with a slope of 3-in-12 or less require a fully bonded covering to protect against the effects of pooling water.





## HOW TO MEASURE A SLOPE

Hold a carpenter's square against the roofline, with the top arm horizontal (check it with a level). Position the square so it intersects the roof at the 12" mark. On the vertical arm, measure down from the top to the point of intersection to find the rise.



**Protect against damage from falling materials when working on the roof.**  
Hang tarps over the sides of the house, and lean plywood against the house to protect the vegetation and siding.



## ESTIMATING TIME REQUIREMENTS

TASK	TIME REQUIRED	× AMOUNT	= TOTAL TIME
Install felt paper	30 min./square		
Tear-off	1 hr./square*		
<b>APPLY SHINGLES:</b>			
Dormers	add 1 hour each		
Flat run	2 hrs./square**		
Ridges, hips	30 min./10'		
<b>FLASHING:</b>			
Chimneys	2 hrs. ea.		
Drip edge	30 min./20'		
Roof vents	30 min. ea.		
Skylights	2 hrs. ea.		
Valleys	30 min./10'		
Vent pipes	30 min. ea.		
<b>TOTAL TIME FOR PROJECT</b>			

NOTE: All time estimates are based on one worker. Reduce time by 40% if you have a helper.

\*One square=100 sq. ft.

\*\*Include area of dormer surface in "flat run" estimate



## Working Safely

Working on the exterior of a house presents challenges not faced in the interior, such as dealing with the weather, working at heights, and staying clear of power lines. By taking a few commonsense safety precautions, you can perform exterior work safely.

Dress appropriately for the job and weather. Avoid working in extreme temperatures, hot or cold, and never work outdoors during a storm or high winds.

Work with a helper whenever possible—especially when working at heights. If you must work alone, tell a family member or friend so the person can check in with you periodically. Keep your cell phone handy at all times.

Don't use tools or work at heights after consuming alcohol. If you're taking medications, read the label and follow the recommendations regarding the use of tools and equipment.

When using ladders, extend the top of the ladder 3 feet above the roof edge for greater stability. Climb on and off the ladder at a point as close to the ground as possible. Use caution and keep your center of gravity low when moving from a ladder onto a roof. Keep your hips between the side rails when reaching over the side of a ladder, and be careful not to extend yourself too far and throw off your balance. Move the ladder as often as necessary to avoid overreaching. Finally, don't exceed the workload rating for your ladder. Read and follow the load limits and safety instructions listed on the label.





**Always wear appropriate clothing and safety equipment when working at heights. Eye protection and hearing protection are important when using power tools or pneumatic tools. And if you'll be climbing on a roof, wear tennis shoes or any sturdy shoe with a soft sole designed for gripping. When roofing, do not wear hard-soled shoes or boots, which can damage shingles and are prone to slipping. On sloped roofs, fall-arresting gear should always be worn. The rig**

seen here (see Resources, shown [here](#)) is affordable for homeowner use. You can also rent fall-arresting gear at many rental centers.



## SAFETY TIPS



Use a GFCI extension cord when working outdoors. GFCIs (ground-fault circuit-interrupters) shut off power if a ground fault occurs in the electrical circuit.





**Enlist a helper to raise an extension ladder.** A reliable rule of thumb for the correct distance from the ladder feet to the bracing wall is  $\frac{1}{4}$  of the height of the ladder's extension (if the ladder is extended 12 feet, position the feet of the ladder 3 feet from the wall). Once in position, and with a helper bracing the ladder feet, extend the ladder to the required height and then walk it upright until it rests against the house.





Use fiberglass ladders when working near power cables. Exercise extreme caution around these cables, and only work near them when absolutely necessary.



Never climb a ladder with a loaded air nailer attached to a pressurized air hose. Even with trigger safeties, air guns pose a serious danger to the operator as well as anyone who may be standing near the ladder. Connect the gun to the hose only after you are off the ladder safely.



## LADDER SAFETY TIPS



Attach a ladder jack to your ladder by slipping the rung mounts over the ladder rungs. Level the platform body arm, and lock it into place.





Set the plank in place on the platform arm. Adjust the arm's end stop to hold the plank in place.





**Stabilize your ladder with stakes driven into the ground, behind each ladder foot. Install sturdy blocking under the legs of the ladder if the ground is uneven.**



**Make sure both fly hooks are secure before climbing an extension ladder. The open ends of the hooks should grip a rung on the lower fly extension.**



## Fall-Arresting Gear

Even if you consider yourself dexterous and are comfortable working in high places, all it takes is one misstep on a roof to lead to a tragic fall. Despite the fact that many professional roofers never don safety harnesses, you should seriously consider investing in personal fall-arresting gear if you plan to reroof your home.

Fall-arresting gear consists of several components. Wear a webbed body harness that spreads the impact of a fall over your shoulders, thighs, and back to reduce injury. Harnesses are made to fit average adult builds. The harness connects to a shock absorber and a lanyard around 6 feet in length. A self-locking, rope-grab mechanism attaches the lanyard to a lifeline that must be fastened securely to a ridge anchor screwed to roof framing. In the event that you slip or fall, the rope grab will limit your fall to the length of the lanyard because it will not move down the lifeline unless you override the locking mechanism by hand.

Many rental centers carry fall-arresting gear, or you can buy a complete system for less than \$100 (see Resources, shown [here](#)). When compared with the loss of life or limb, however, your real investment is small. Better yet, you'll have it available any time you need to get on the roof for cleaning tasks or to make repairs.



### TOOLS & MATERIALS

- Pry bar
- Drill/driver
- Harness
- Lanyard



Rope grab  
Synthetic fiber lifeline  
Ridge anchor



A metal ridge anchor must be secured with screws to the roof framing. Follow the manufacturer's recommendations for proper screw sizing, and make sure your attachment points go beyond the roof sheathing into the roof trusses or rafters.





The rope-grab mechanism allows you to move up a roof along the lifeline without interference. To move down the roof, you'll need to override the grab by hand. As soon as you release it, the lock engages again.



Personal fall-arresting gear consists of a lifeline (A) with mechanical rope grab (B) and lanyard (C); a metal ridge anchor (D); and a body harness (E).



## Lifting & Staging Shingles

Carrying bundles of asphalt shingles up a ladder and onto a roof deck is a grueling job, especially if you have as many as 50 bundles to haul. With each bundle weighing 65 to 75 pounds, you need to be concerned about two issues: your safety and how to stage the material for efficient installation. The easiest solution is to simply have your roofing supplier unload the shingles directly to your roof with a boom truck or conveyor belt. This will cost a nominal fee, but the physical exertion you'll avoid may be well worth the cost.

If you must manually unload the bundles from your supplier while on the roof, place the first bundle or two flat on the roof to serve as a base, then stack subsequent bundles partially on the first two and partially on the roof deck. Limit your stack sizes to a dozen bundles or less to help distribute the weight. If possible, place the bundles at a point where two roofs intersect for added stability. Distribute your stacks evenly along the length of the roof ridge so they are readily available wherever you're working as the job progresses. Since the ridge is the last area shingled, most of your supply should be used and out of the way by the time you reach the peak.

For smaller jobs, you may elect to simply carry the bundles up to the roof yourself. In this situation, wear a back support brace to prevent back strain, and carry one bundle at a time over your shoulder so you can keep one hand on a ladder rung at all times. Hand off each bundle to a helper waiting for you on the roof. Switch jobs before you get tired to conserve your energy and share the really hard work.

## How to Stage Shingles



Lumbar support brace

When you must carry bundles up a ladder, wear a lumbar support brace to prevent back strain. Take your time carrying each bundle, and rest often. Make sure the bundle is well balanced before you ascend the ladder. If you feel the weight of the bundle start to shift, drop the bundle immediately for your safety. Have a helper waiting for you when you reach the roof deck so you don't have to unload bundles near the eave or risk a fall.





Build stable stacks of a dozen bundles of shingles near the roof ridge. Create stacks by placing two bundles flat on the roof, then adding more bundles that straddle both the first two and the roof deck. When possible, stack bundles where two roof areas meet.



## ROOF JACKS

Sure footing isn't an issue when you're working on a low-pitched roof, but it becomes a real safety concern for roofs with 7-in-12 or steeper pitches. In these situations, you need to install roof jacks to create a stable work area and navigate the roof safely. Roof jacks are steel braces that nail temporarily to roof decking to support a  $2 \times 8$  or  $2 \times 10$  perch. In addition to improving your footing, roof jacks also provide a flatter surface to stand on, which can help reduce ankle strain. Roof jacks should be installed every 4' of plank length with 16d nails. They're inexpensive and available wherever roofing products are sold.



**Roof jacks** are steel braces that are nailed to the roof deck. Installed in pairs, they support a dimensional board (usually a 2 × 8) to create a sturdy work platform on a sloped roof.



## TOOLS & MATERIALS

Pry bar

Hammer

16d nails

Roof jacks

2 × 8 or 2 × 10 lumber



## How to Install Roof Jacks



Nail roof jacks to the roof at the fourth or fifth course. Drive 16d nails into the overlap, or dead area, where they won't be exposed. Install one jack every 4', with a 6" to 12" overhang at the ends of the boards.





**Shingle over the tops of the roof jacks.** Rest a 2 × 8 or 2 × 10 board on the jacks. Fasten the board with a nail driven through the hole in the lip of each roof jack.





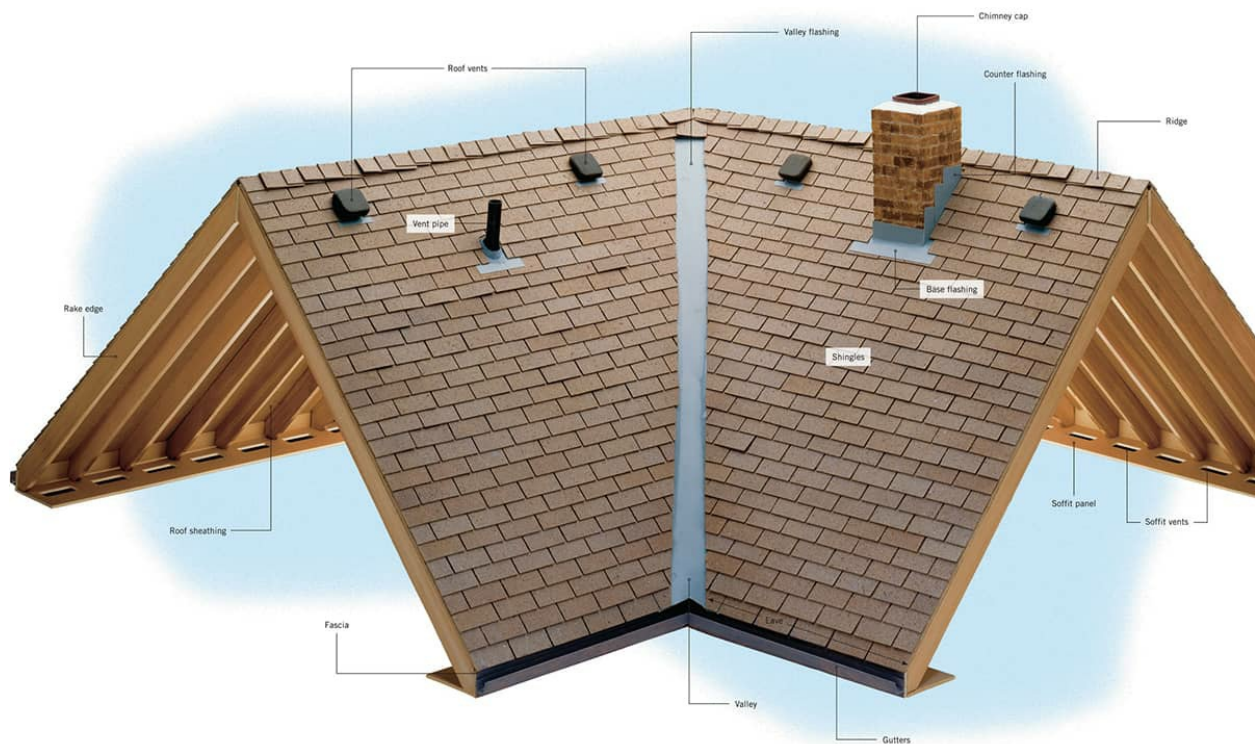
When the project is complete, remove the boards and jacks. Position the end of a flat pry bar over each nail and drive in the nail by rapping the shank with a hammer.





## Roof Systems

The elements of a roof system work together to provide shelter, drainage, and ventilation. The roof covering is composed of sheathing, felt paper, and shingles. Metal flashing is attached in valleys and around chimneys, vent pipes, and other roof elements to seal out water. Soffits cover and protect the eaves area below the roof overhang. Fascia, usually attached at the ends of the rafters, supports soffit panels as well as a gutter and downspout system. Soffit vents and roof vents keep fresh air circulating throughout the roof system.

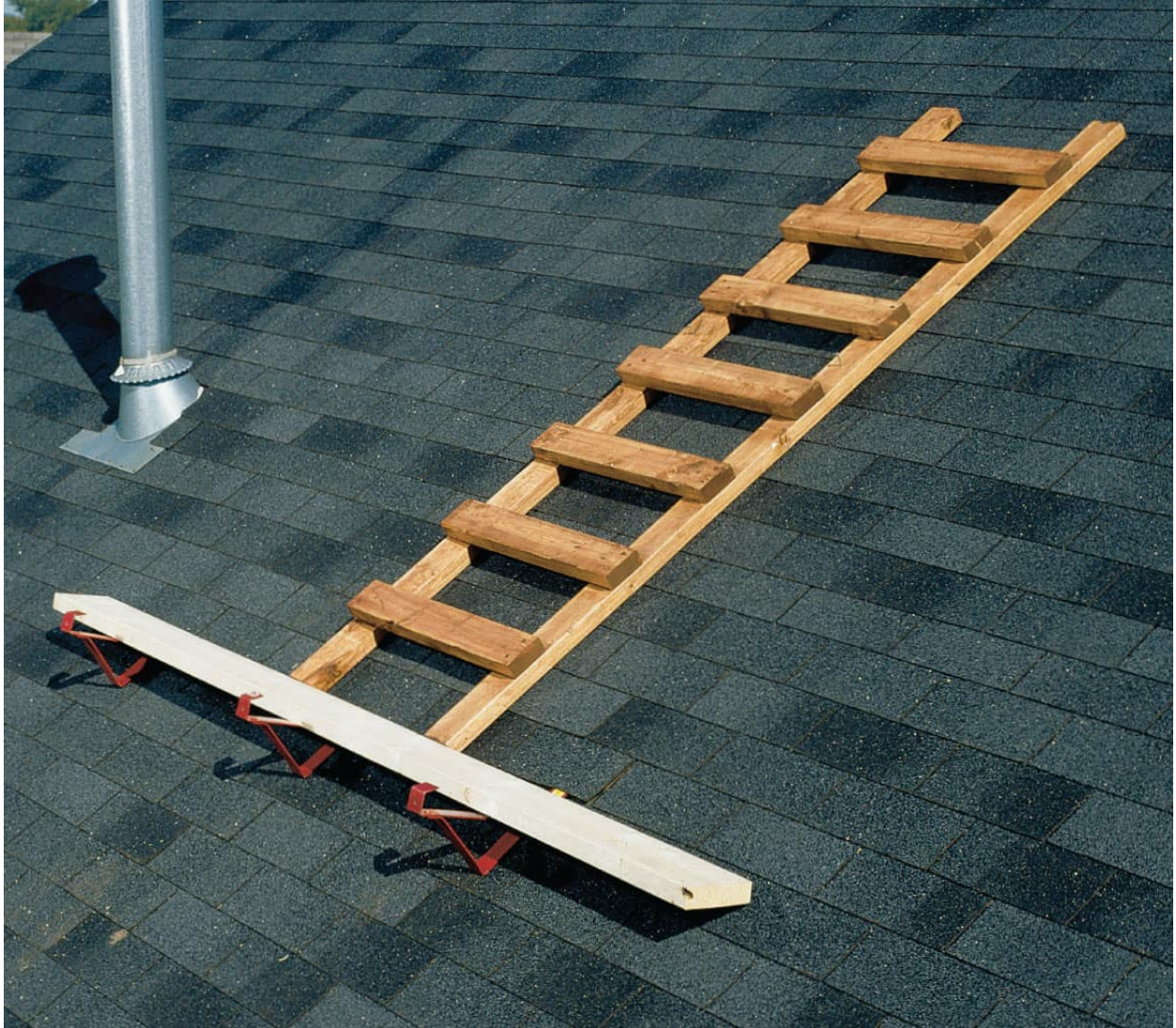




## Tools & Materials

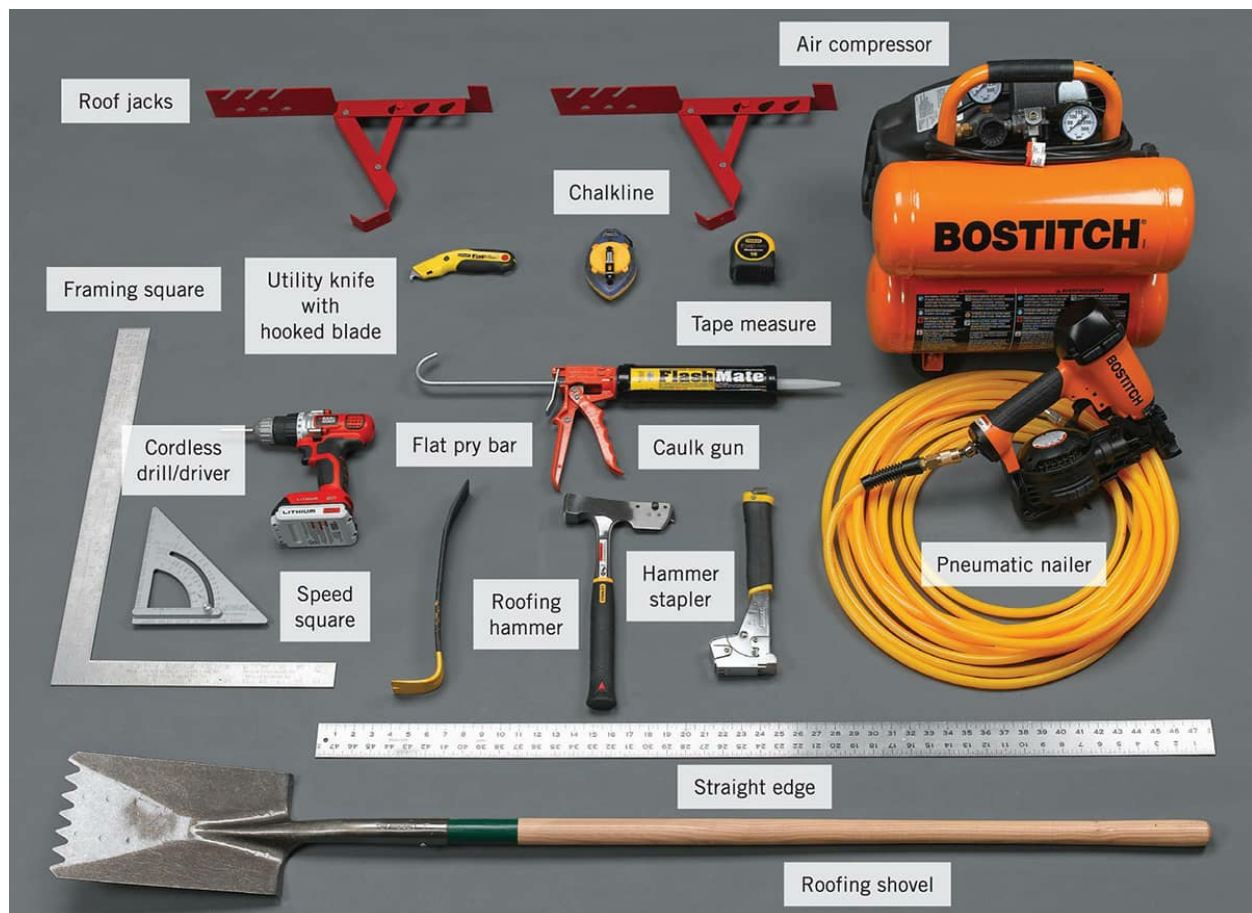
**R**oofing is tough work, hard on the back, hands, and upper body. Make the job as easy as possible by gathering the right tools and equipment before you begin. Doing so will make the work go faster and spare you physical wear and tear. Many of the necessary tools will prove useful for other DIY projects.

Some of these tools, such as a pneumatic nailer or a roofer's hatchet, are specific to roofing projects. If you don't have them and don't want to buy them, they are rentable. Here are the essential tools you'll need for most roofing jobs.



For more secure footing, fashion a roofing ladder by nailing wood strips across a pair of 2 × 4s. Secure the ladder to the roof jacks, and use it to maintain your footing.

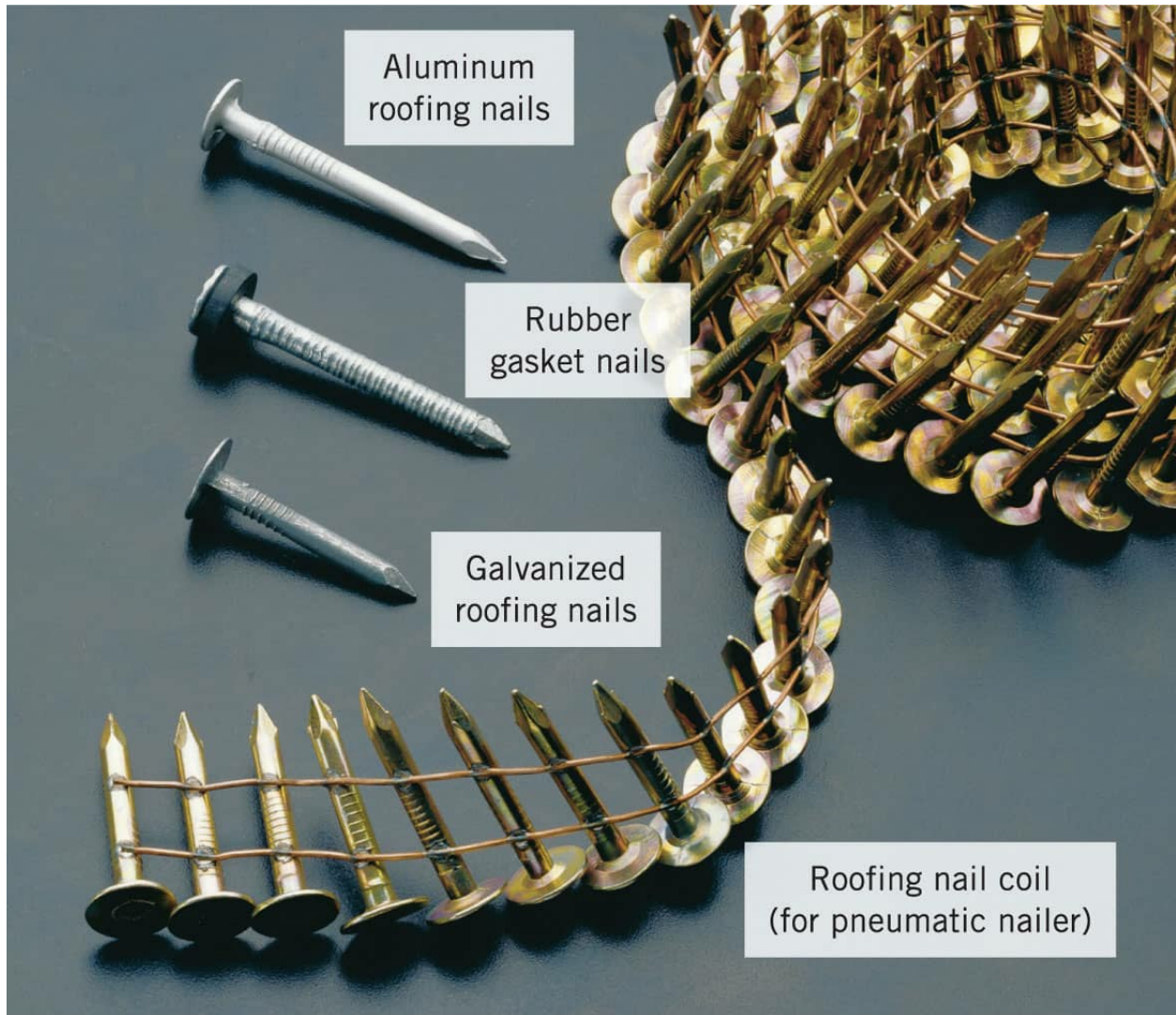




Several roofing tools may already be in your toolchest. Other tools, such as a pneumatic nailer, ladder jacks, and a roofing hammer, are wise additions to your DIY arsenal.



Roof flashing can be hand cut or purchased in preformed shapes and sizes. Long pieces of valley flashing, base flashing, top saddles, and other nonstandard pieces can be cut from rolled flashing material using aviation snips. Step flashing blanks can be bought in standard sizes and bent to fit. Drip edge and vent pipe flashing are available preformed. Skylight flashing usually comes as a kit with the window. Complicated flashings, such as chimney crickets, can be custom fabricated by a metalworker.



Different fasteners are specially developed for different jobs. Use galvanized roofing nails to hand nail shingles; use aluminum nails for aluminum flashing; use rubber gasket nails for galvanized metal flashing; and use nail coils for pneumatic nailers.





Common roofing materials include 30# felt paper for use as underlayment; ice and water shield for use as underlayment in cold climates; and tubes of roofing cement for sealing small holes and adhering shingles or flashing.



## Completing the Tear Off

**R**emoving shingles, commonly referred to in the roofing trade as the tear off, can be done rather quickly. This makes it one of the more satisfying parts of a reshingling project. If you can't reshingle your entire roof in one day, tear off one section of roofing at a time, roof that section, then move on to the next part of the roof.

The tear off produces a lot of waste. A few preparatory steps make cleanup much easier. Lay tarps on the ground and lean sheets of plywood against the house to protect shrubbery and the siding.

If renting a dumpster isn't practical or you can't get one close to the roof, set wheelbarrows on tarps as an alternative for catching debris. However, you'll still be responsible for disposing of the old roofing materials, which will probably require several trips to the landfill. To work efficiently, have another person deal with the debris on the ground as you work on the roof. Always wear appropriate safety gear.



### TOOLS & MATERIALS

- Wheelbarrow or dumpster
- Hammer
- Chisel
- Pry bar
- Utility knife
- Roofing shovel or pitchfork
- Broom
- Release magnet

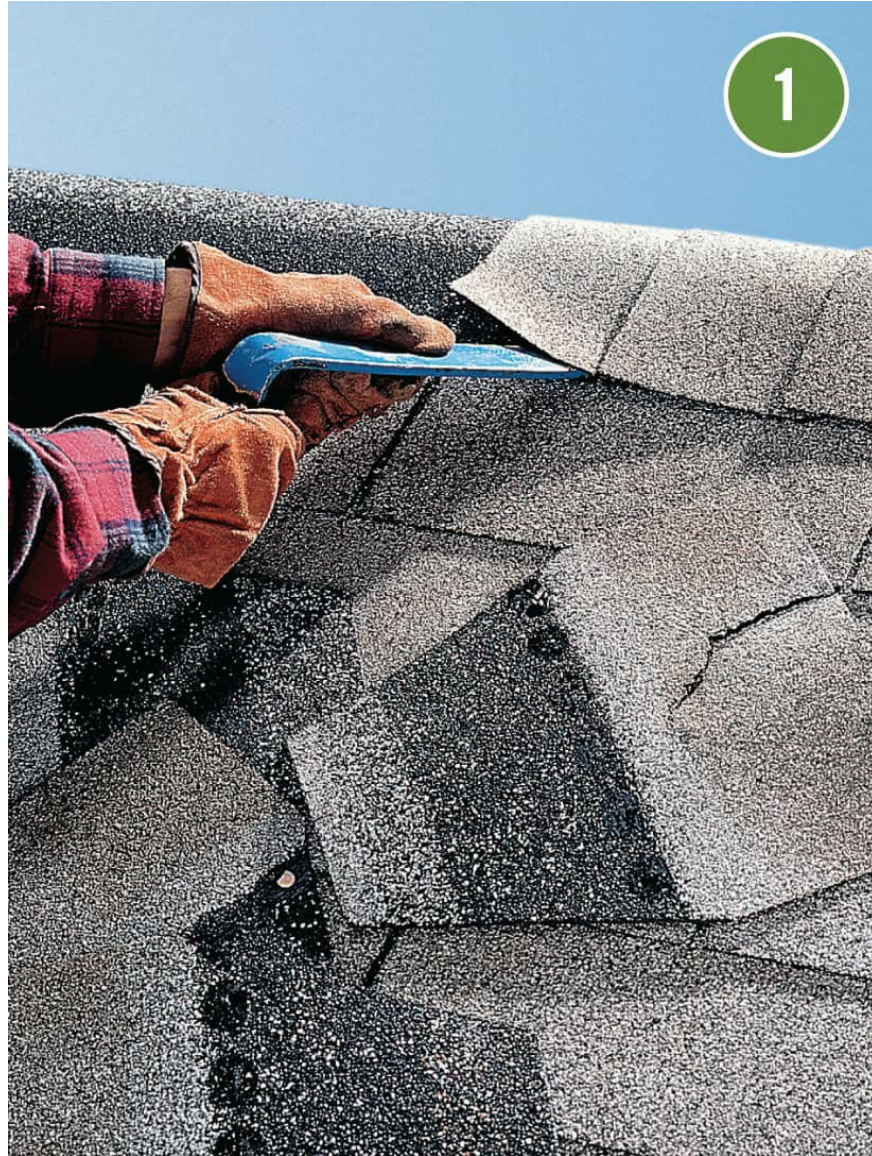
Rake  
Tin snips  
Reciprocating saw  
Drill  
Protective gear  
Tarps



Rent a dumpster from a waste disposal company or your local waste management department. If you are re-roofing, position the dumpster directly below the roof edge, so when you're tearing off the old roofing materials, the debris can be dumped from the roof directly into the dumpster.

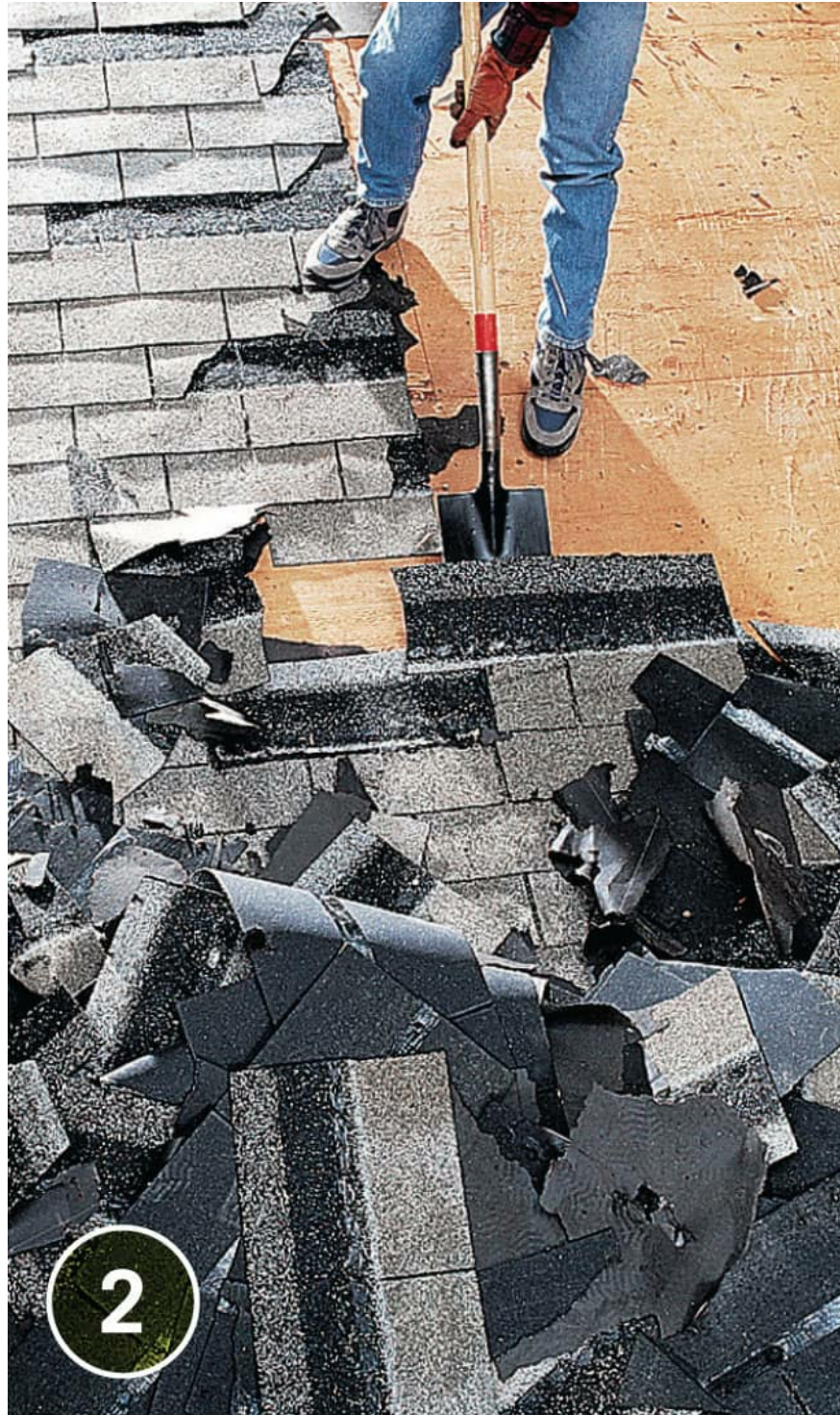


# How to Tear Off Old Shingles



Remove the ridge cap using a flat pry bar. Pry up the cap shingles at the nail locations.





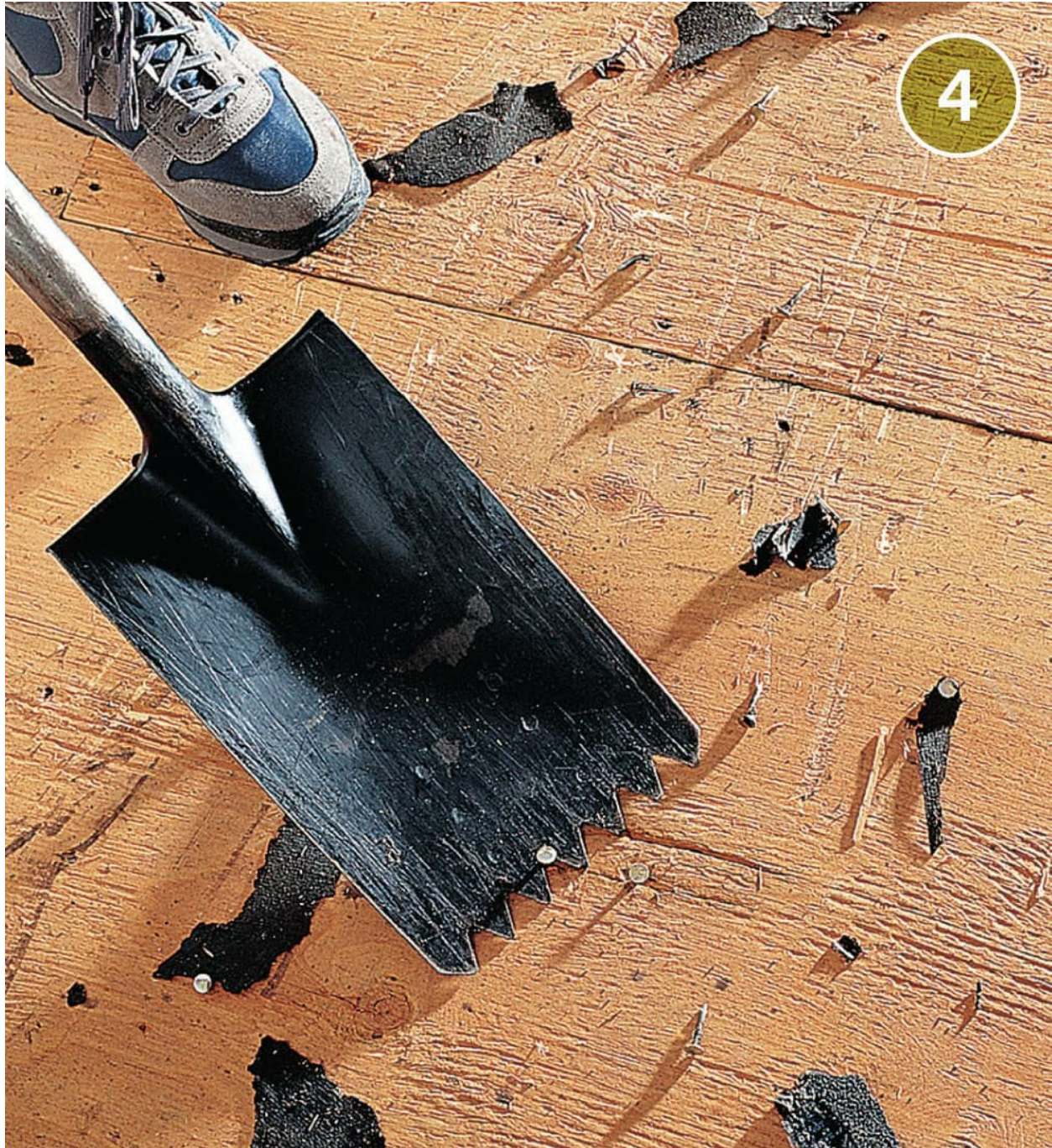
Working downward from the peak, tear off the building paper and old shingles with a roofing shovel or pitchfork.





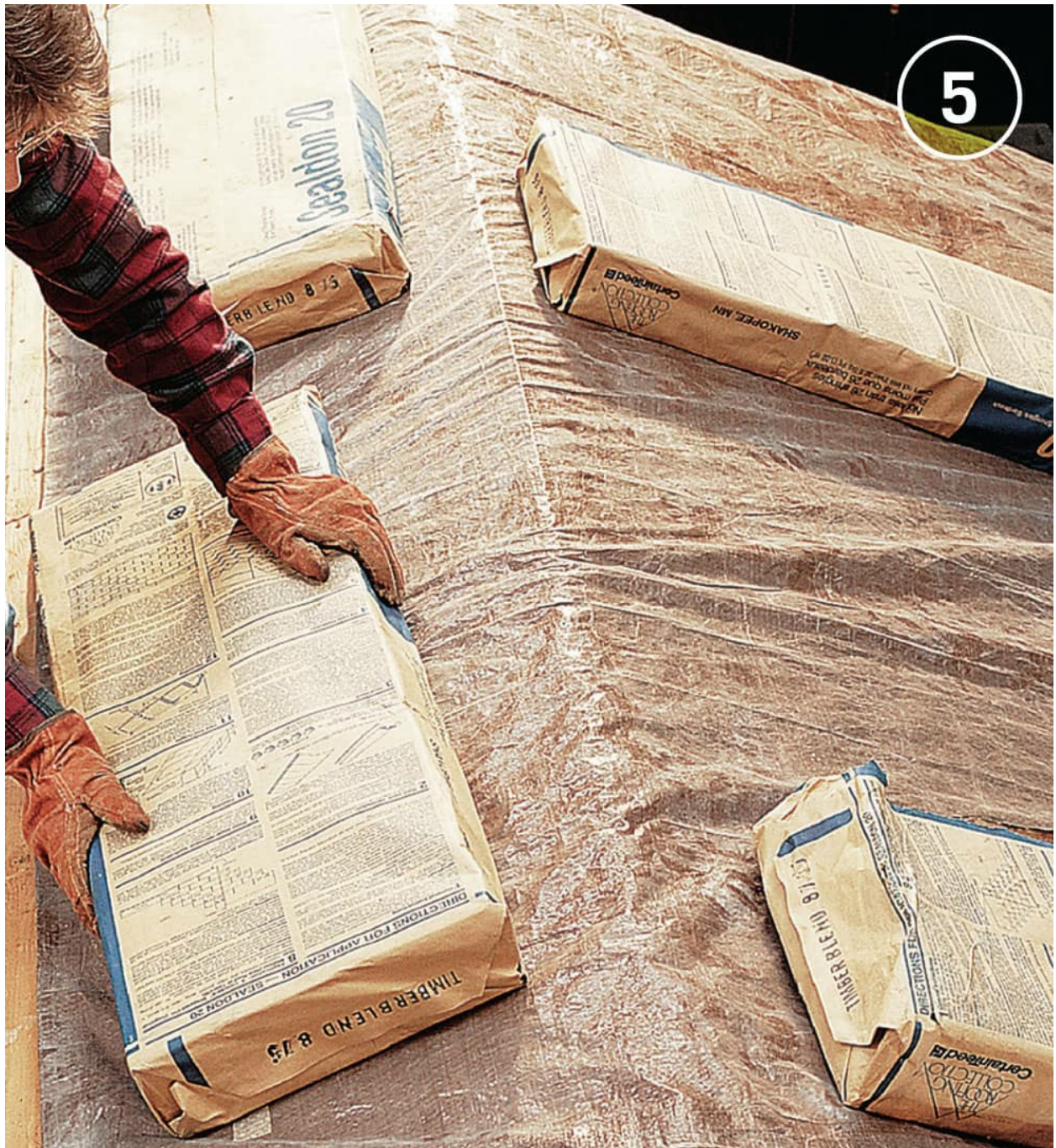
Remove flashing by cutting and prying. Avoid damaging pipes and vents. You may be able to salvage longer flashing pieces, such as chimney saddles and crickets.





After removing the shingles, building paper, and flashing from the entire tear-off section, pry out any remaining nails and sweep the roof. In some cases it is easier to drive nail heads flush with the roof surface.





If an unexpected delay keeps you from finishing a section before nightfall, cover any unshingled sections using tarps weighted down with shingle bundles.



## Replacing Sheathing

Once the tear off is complete, inspect the roof decking for damage. If there are any soft spots on the roof, or if a portion of the sheathing is damaged, it'll need to be replaced. Most older roofs are constructed with board sheathing, usually 1 × 6s, while newer roofs typically use 4 × 8-foot sheets of plywood or oriented strandboard (OSB). Even if your roof has board sheathing, you can make the repairs with plywood, as we're doing here. Make sure the plywood is the same thickness as your current sheathing and rated for exterior use.

Before cutting into your roof, check under the sheathing for wires. There may be telephone wires or television cable hidden in the roof, and you don't want to cut through them. Avoid walking on the damaged sheathing. If you have access from the underside, it may be safer to remove the sheathing from below.

Damage to the roof sheathing normally occurs because there is a violation of the roof seal, typically occurring around a chimney, roof vent, skylight or another flashed object. If you will be reflash the roof, make sure you don't repeat any mistakes. If you are making only localized repairs, be sure that you identify and correct the source of the moisture that's caused the deterioration. If the damage is located near the eave and is not caused by a flashing problem or a leak in the roof covering, it is probably caused by an ice dam (see [here](#)).



### TOOLS & MATERIALS

Circular saw



Reciprocating saw  
Tape measure  
Chalkline  
Flat pry bar  
Drill  
Sheathing  
2 × 4 nailing strips  
3", 2½" deck screws  
Plywood  
8d ring-shank siding nails



**Inspect for damaged sheathing after tear off is completed. Replace damaged roof deck, making sure the new seams fall over rafters. Also replace trim boards in the repair area if they have become damaged.**

## How to Replace Damaged Sheathing



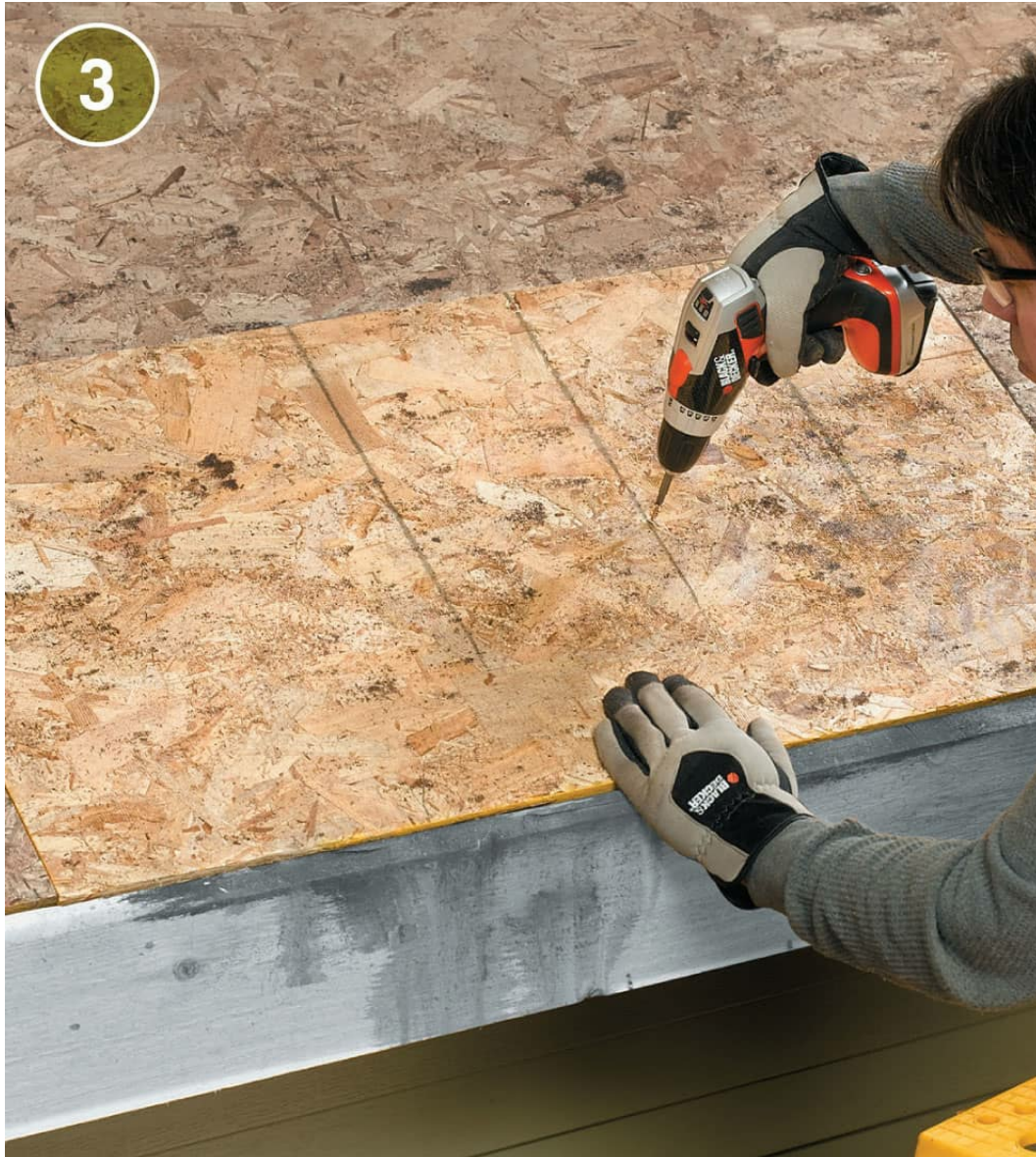
Use a reciprocating saw to cut next to the rafters in an area that extends well beyond the damaged area. Pry out the damaged sections using a pry bar.





Attach 2 × 4 nailing strips to the inside edges of the rafters using 3" deck screws





Use exterior grade plywood or OSB to make a patch. Measure the cutout area, allow for a 1/8" gap on all sides for expansion, and cut the patch to size. Attach the patch to the rafters and nailing strips using 2½" deck screws or 8d ring-shank siding nails.



**OPTION:** If your existing roof deck is made of boards (1 × 6 was common before plywood took over the market), it is perfectly acceptable to use plywood when replacing a section of the deck. The plywood should be the same thickness as the boards, generally  $\frac{3}{4}$ ".



## Underlayment

**B**uilding paper, also called felt paper or tar paper, is installed on roof decks as insurance in case leaks develop in shingles or flashing. It's sold in several weights, but heavier 30# paper is a good choice for use under shingles and may be required by code.

In cold climates, codes often require an additional underlayment called “ice and water shield” or “ice guard” that's used instead of standard building paper for the first one or two courses of underlayment and in valleys. In cold climates, apply as many courses of ice and water shield as it takes to cover 36 inches past the roof overhang. An adhesive membrane, the ice guard bonds with the roof sheathing and seals around nails to create a barrier against water backing up from ice dams.

A hammer stapler greatly speeds installation of building paper. Watch for any loose nails missed during the tear off and nail down any protruding staples. Avoid walking on building paper; it is slippery and can easily tear away from its staples. Some roofers opt to apply one course of building paper at a time, applying four or five courses of shingles before rolling out the next course of building paper.



### TOOLS & MATERIALS

Chalkline

Hammer stapler

Flat pry bar

Utility knife

Tape measure

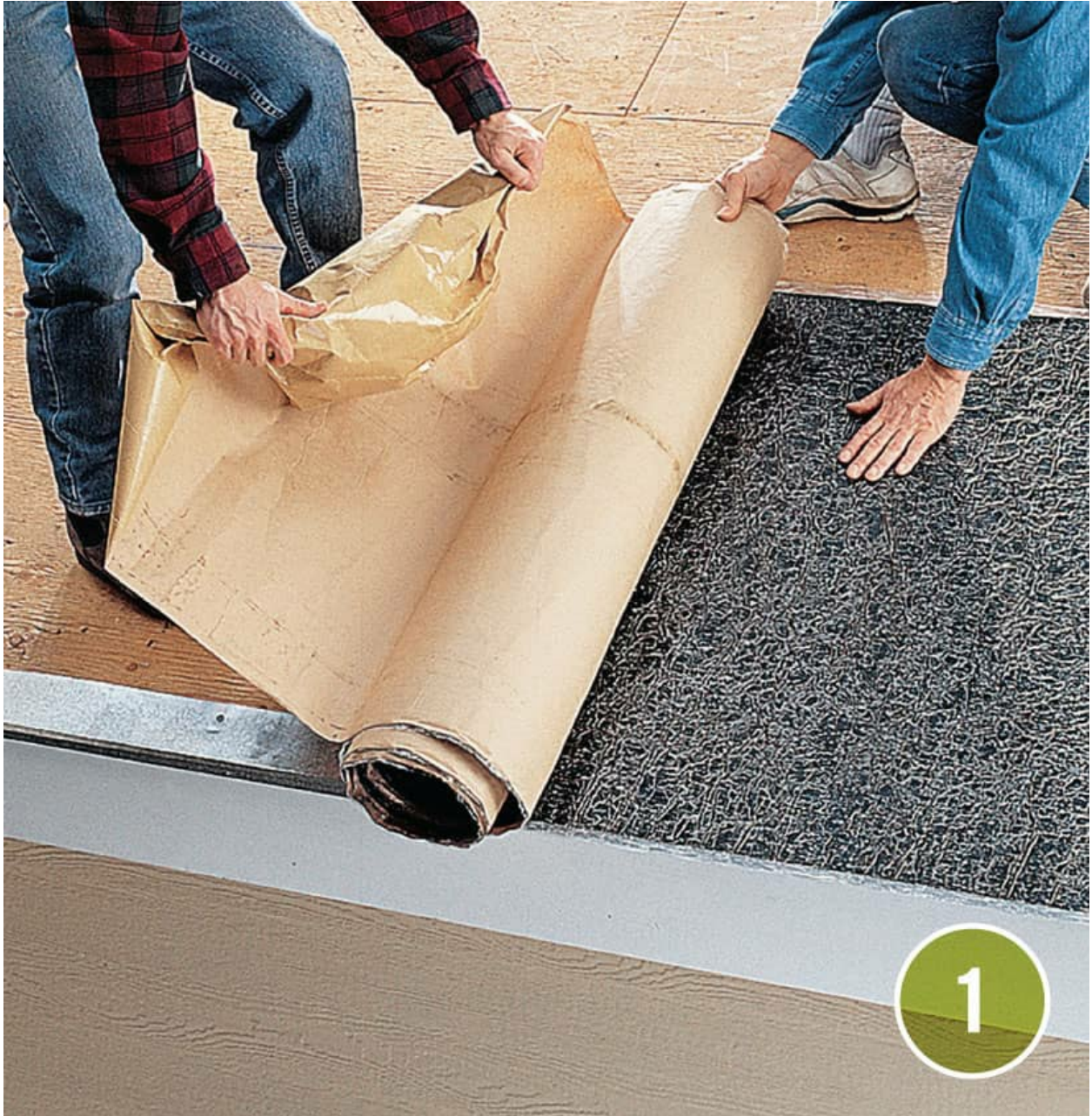


Caulk gun  
30# building paper  
Ice and water shield  
Staples  
Roofing cement



**For optimum roof protection, apply ice and water shield in valleys, along the eaves, and along the rake edges of the roof. Apply 30# building paper over the remainder of the roof.**

## How to Install Underlayment



Snap a chalkline  $35\frac{5}{8}$ " up from the eaves, so the first course of the 36"-wide membrane will overhang the eaves by  $\frac{3}{8}$ ". Install a course of ice and water shield, using the chalkline as a reference and peeling back the protective backing as you unroll it.





Measuring up from the eaves, make a mark 32" above the top of the last row of underlayment, and snap another chalkline. Roll out the next course of building paper (or ice guard, if required) along the chalkline, overlapping the first course by 4".

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**TIP:** Drive staples every 6 to 12" along the edges of building paper, and one staple per sq. ft. in the field area.





At valleys, roll building paper across from both sides, overlapping the ends by 36". Install building paper up to the ridge—ruled side up—snapping horizontal lines every two or three rows to check alignment. Overlap horizontal seams by 4", vertical seams by 12", and hips and ridges by 6". Trim the courses flush with the rake edges.



**Apply building paper up to an obstruction, then resume laying the course on the opposite side (make sure to maintain the line). Cut a patch that overlaps the felt paper by 12" on all sides. Make a crosshatch cutout for the obstruction. Position the patch over the obstruction, staple it in place, then trim away the crosshatch flaps for a close fit.**





**At the bottom of dormers and sidewalls, tuck the felt paper under the siding where it intersects with the roof. Carefully pry up the siding and tuck at least 2" of paper under it. Also tuck the paper under counter flashing or siding on chimneys and skylights. Leave the siding or counter flashing unfastened until after you install the step flashing.**





## Drip Edge

**D**rip edge is a flashing that's installed along the eaves and rake edges of the roof to direct water away from the roof decking. Although its job is to deflect water, it also gives the edges of the roof an attractive finish. A corrosion-resistant material, drip edge won't stain your roofing materials or fascia.

The flashing is installed along the eaves before the building paper is attached to allow water to run off the roof in the event it gets under the shingles. Drip edge is installed at the rake edges after the building paper has been attached to keep wind-driven rain from getting under the paper.

Drip edge is always nailed directly to the roof decking, rather than to the fascia or rake boards. The nail heads are later covered by roofing materials.

There are two basic styles of drip edge. One is the C-style drip edge that doesn't have an overhang, and the other, much more common, type is the extended-profile drip edge that has a hemmed overhang along the edges.



### TOOLS & MATERIALS

Hammer

Tape measure

Aviation snips

Drip edge

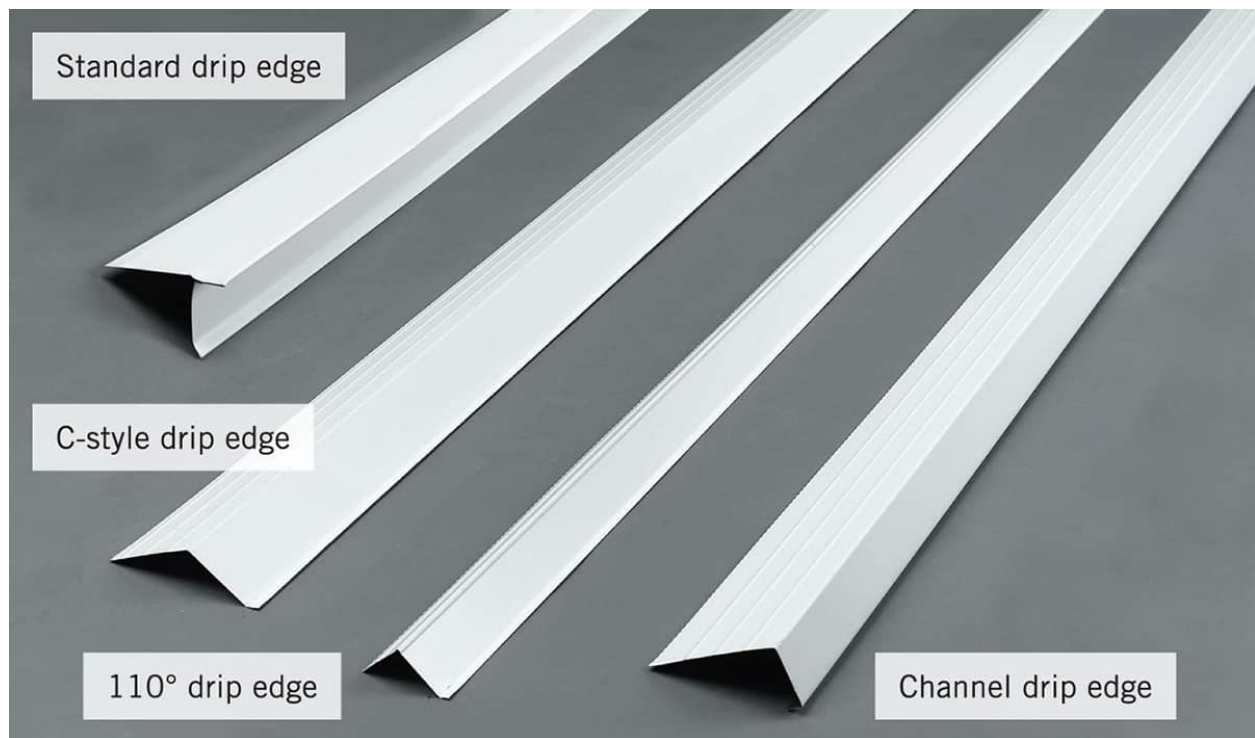
Roofing nails

Circular saw

30# building paper  
Ice and water shield



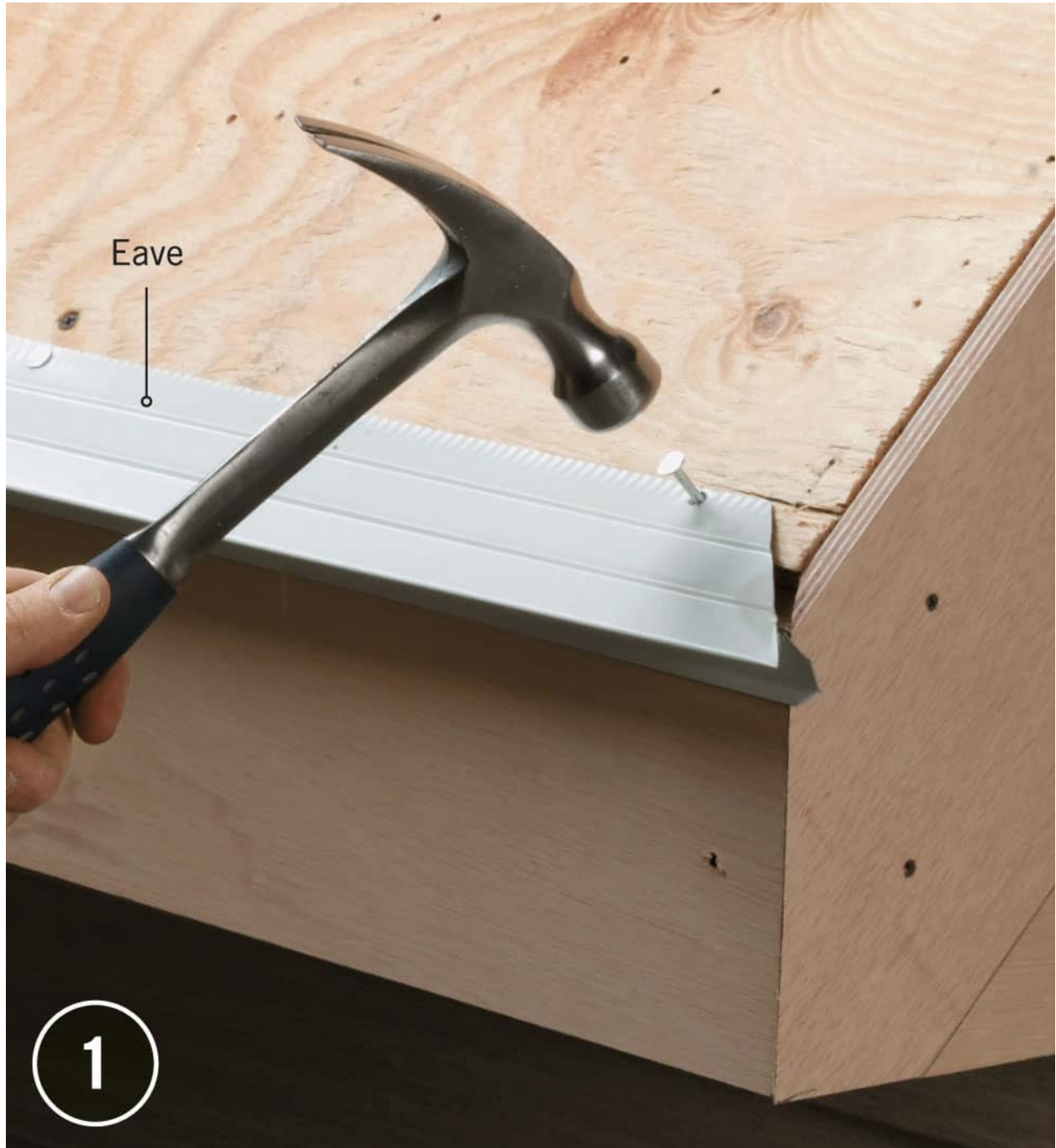
Drip edge flashing prevents water from working its way under the roofing materials along the eaves and rake edges of the roof.



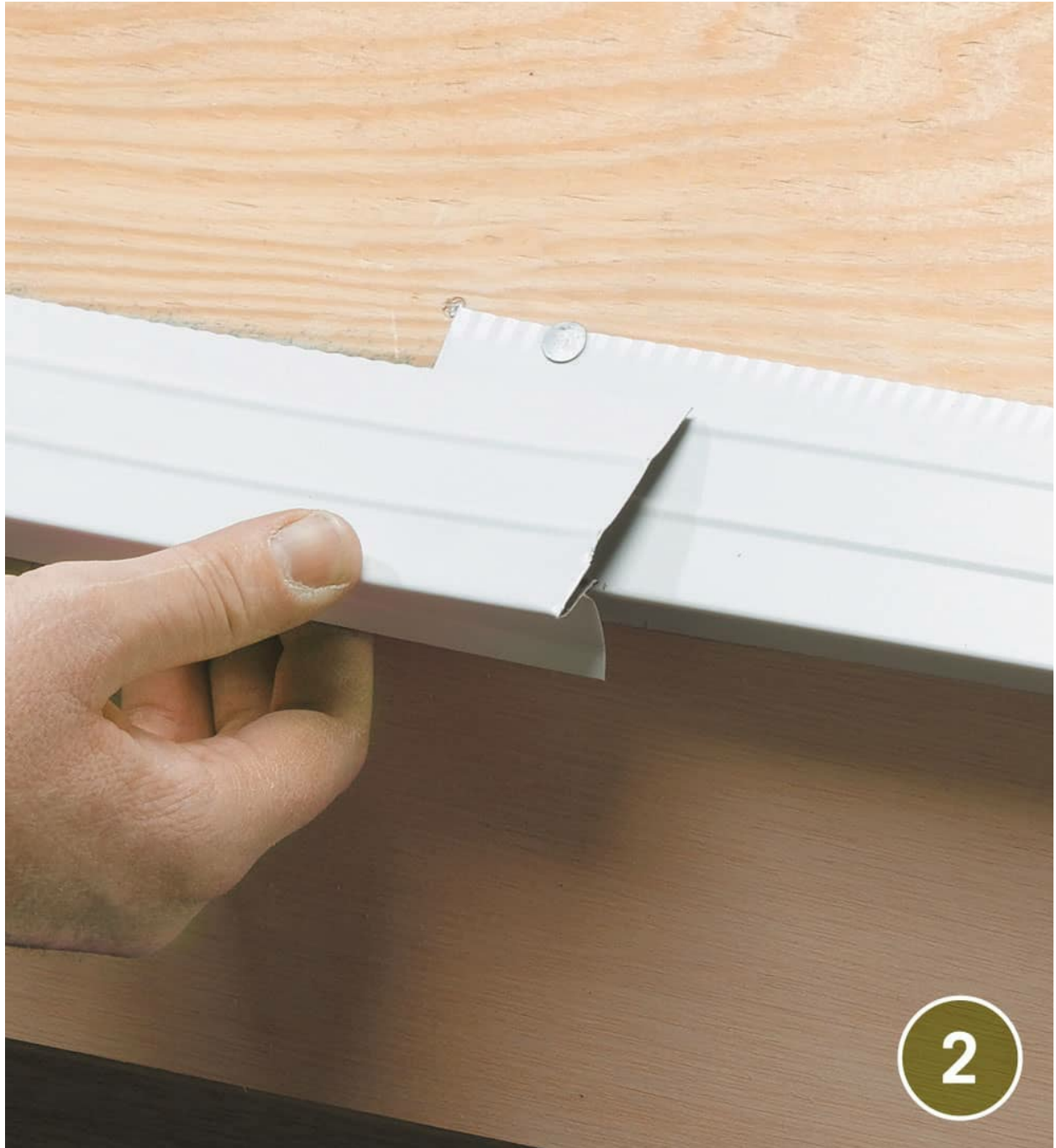
**Drip-edge molding** is made of powder-coated aluminum, generally sold in 10' lengths. Stock colors at most building centers are white and dark brown. It comes in several profiles, although only the standard and channel types are stocked consistently. Take care not to confuse drip cap molding with edge-drip cap, a similar product, also sold in 10' lengths, that is installed above windows and doors.



## How to Install Drip Edge



Cut a 45° miter at one end of the drip edge using aviation snips. Place the drip edge along the eaves end of the roof, aligning the mitered end with the rake edge. Nail the drip edge in place every 12".



**Overlap pieces of drip edge by 2". Install drip edge along the eaves, ending with a mitered cut at the opposite end.**



Apply building paper, and ice guard if needed, to the roof, overhanging the eaves by 3/8" (see [here](#)).





Cut a 45° miter in a piece of drip edge and install it along the rake edge, forming a miter joint with the drip edge along the eaves. Overlap pieces by 2", making sure the higher piece is on top at the overlap. Apply drip edge all the way to the peak. Install drip edge along the other rake edges the same way.



## Asphalt Shingles

If you want to install asphalt shingles on your roof, then you're in good company. Asphalt shingles, also known as composition shingles, are the roofing of choice for nearly four out of five homeowners in America. They perform well in all types of climate and are available in a multitude of colors, shapes, and textures to complement every housing design. They also are less expensive than most other roofing products.

Asphalt shingles are available as either fiberglass shingles or organic shingles. Both types are made with asphalt, the difference being that one uses a fiberglass reinforcing mat, while the other uses a cellulose-fiber mat. Fiberglass shingles are lighter, thinner, and have a better fire rating. Organic shingles have a higher tear strength, are consequently more flexible in cold climates, and are used more often in northern regions.

Although the roofing market has exploded with innovative new asphalt shingle designs, such as the architectural or laminated shingle that offers a three-dimensional look, the standard three-tab asphalt shingle is still the most common. The tabs provide an easy reference for aligning shingles for installation.

To help the job get done faster, rent an air compressor and pneumatic roofing gun. This will greatly reduce the time you spend nailing.



### TOOLS & MATERIALS

Aviation snips

Carpenter's square

Chalkline

Flat pry bar

Roofer's hammer or pneumatic nailer

Utility knife

2-in-1 roofing knife

Straightedge

Tape measure

Caulk gun

Flashing

Shingles

Nail coils

Roofing cement

Roofing nails ( $\frac{7}{8}$ ",  $1\frac{1}{4}$ ")

Rubber gasket nails





**Stagger shingles** for effective protection against leaks. If the tab slots are aligned in successive rows, water forms channels, increasing erosion of the mineral surface of the shingles. Creating a 6" offset between rows of shingles ensures that the tab slots do not align.



# How to Install Three-Tab Shingles

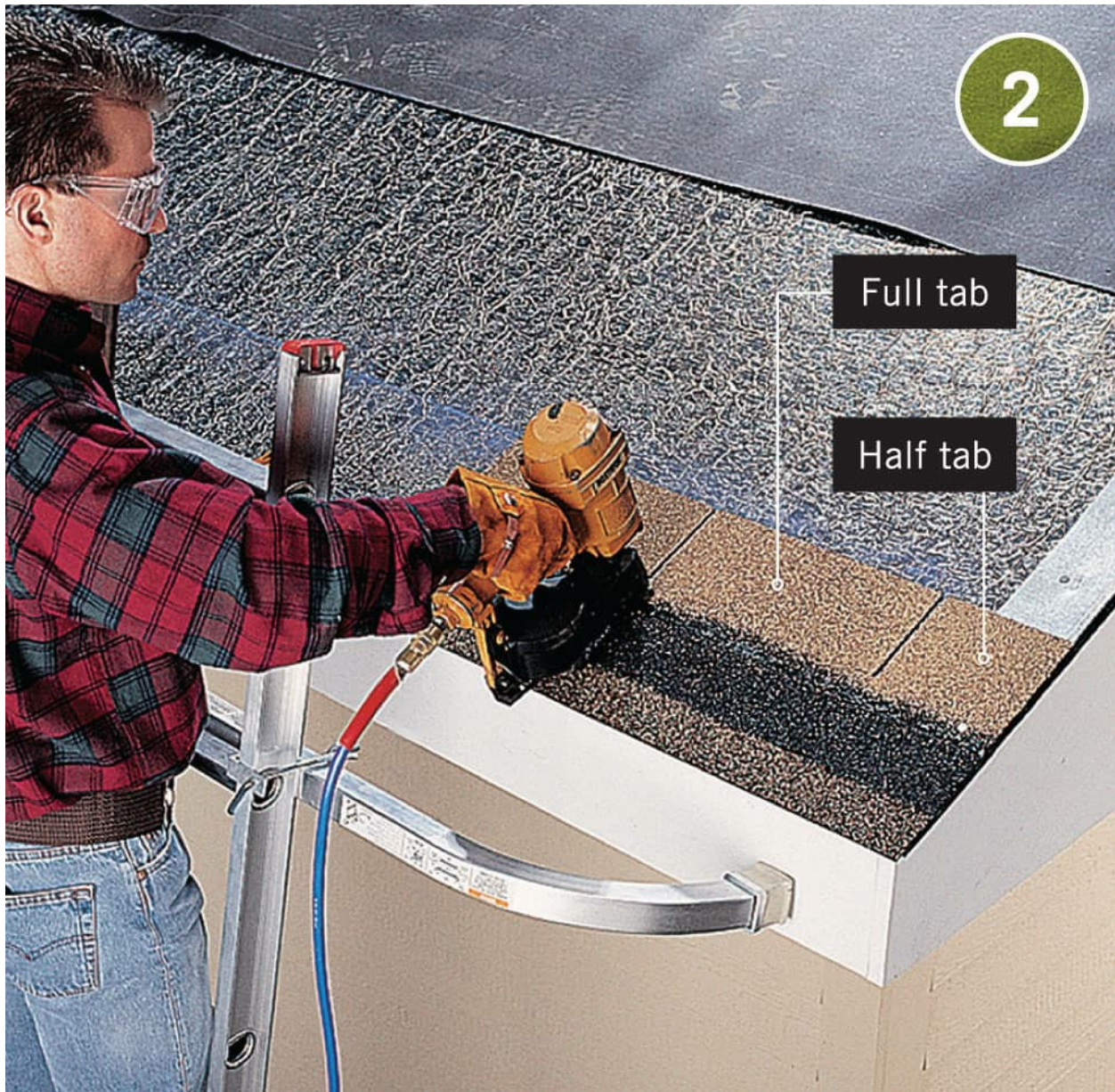


Cover the roof with building paper (shown [here](#)) and install drip edge (shown [here](#)). Snap a chalkline onto the building paper or ice guard 11½" up from the eaves edge, to mark the alignment of the starter course. This will result in a ½" shingle overhang for standard shingles.

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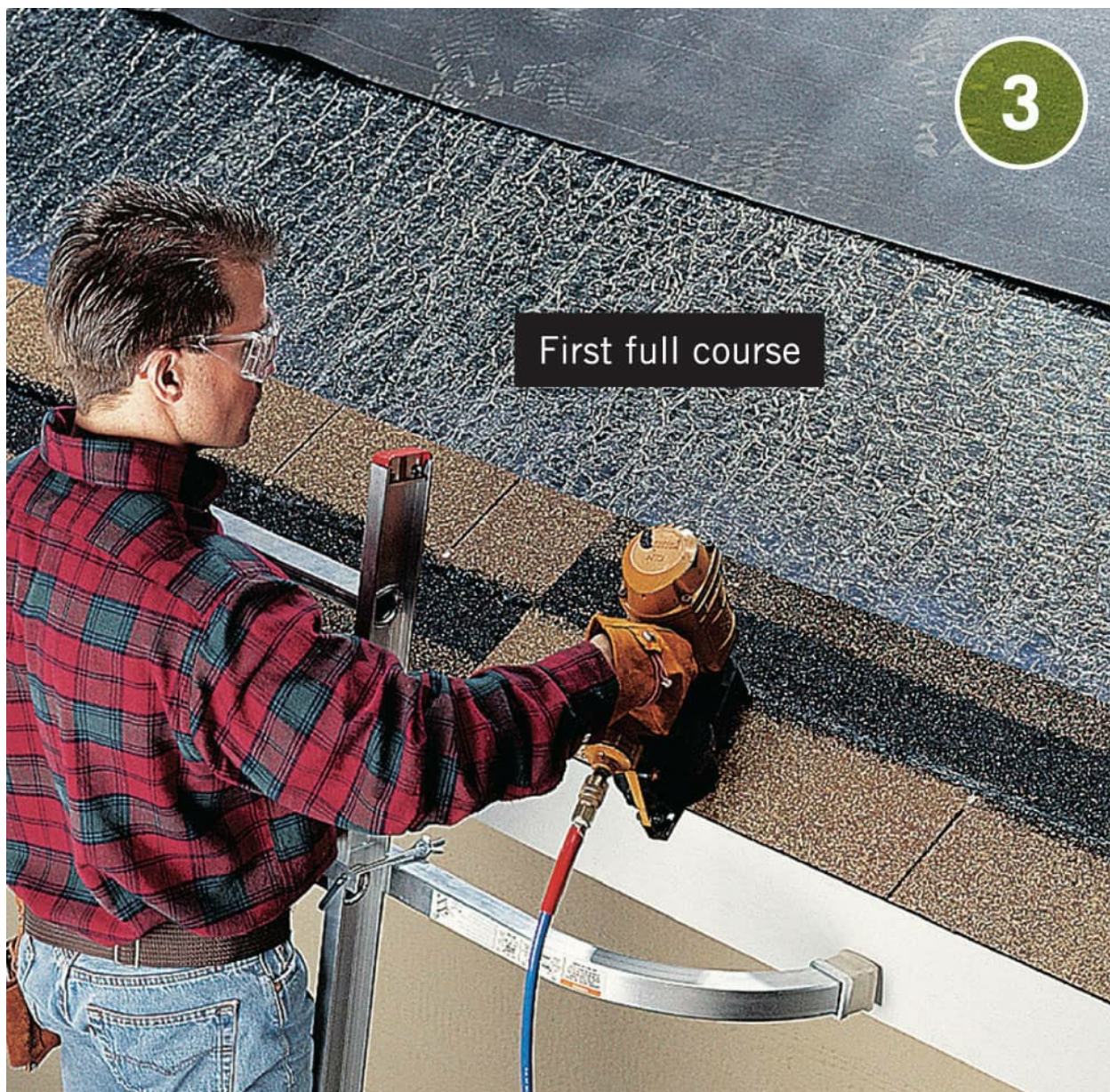
**TIP:** Use blue chalk rather than red. Red chalk will stain roofing materials.





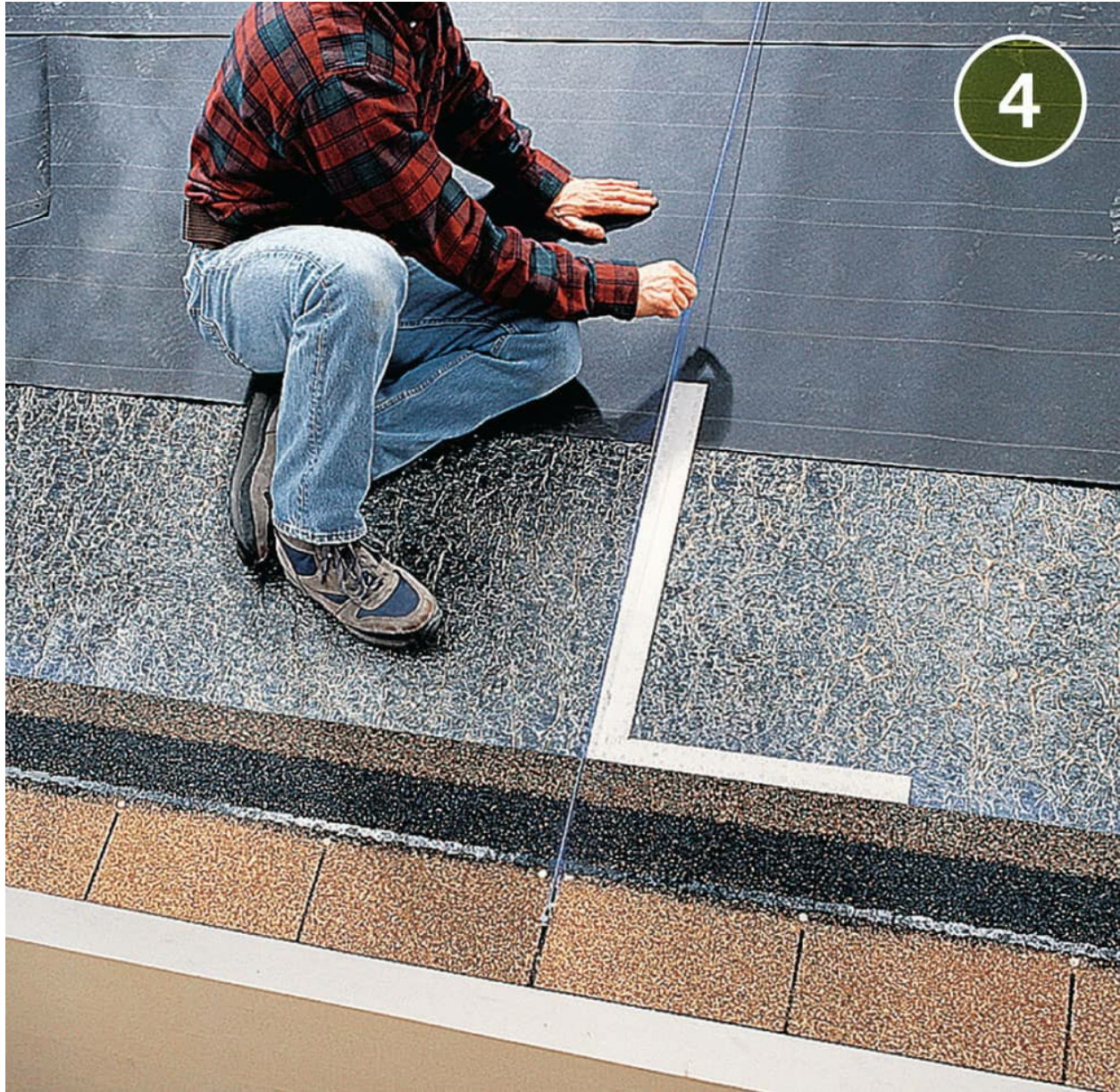
Trim off one-half of an end tab on a shingle. Position the shingle upside down, so the tabs are aligned with the chalkline and the half-tab is flush against the rake edge. Drive 7/8" roofing nails near each end, 1" down from each slot between tabs. Butt a full upside-down shingle next to the trimmed shingle, and nail it. Fill out the row, trimming the last shingle flush with the opposite rake edge.





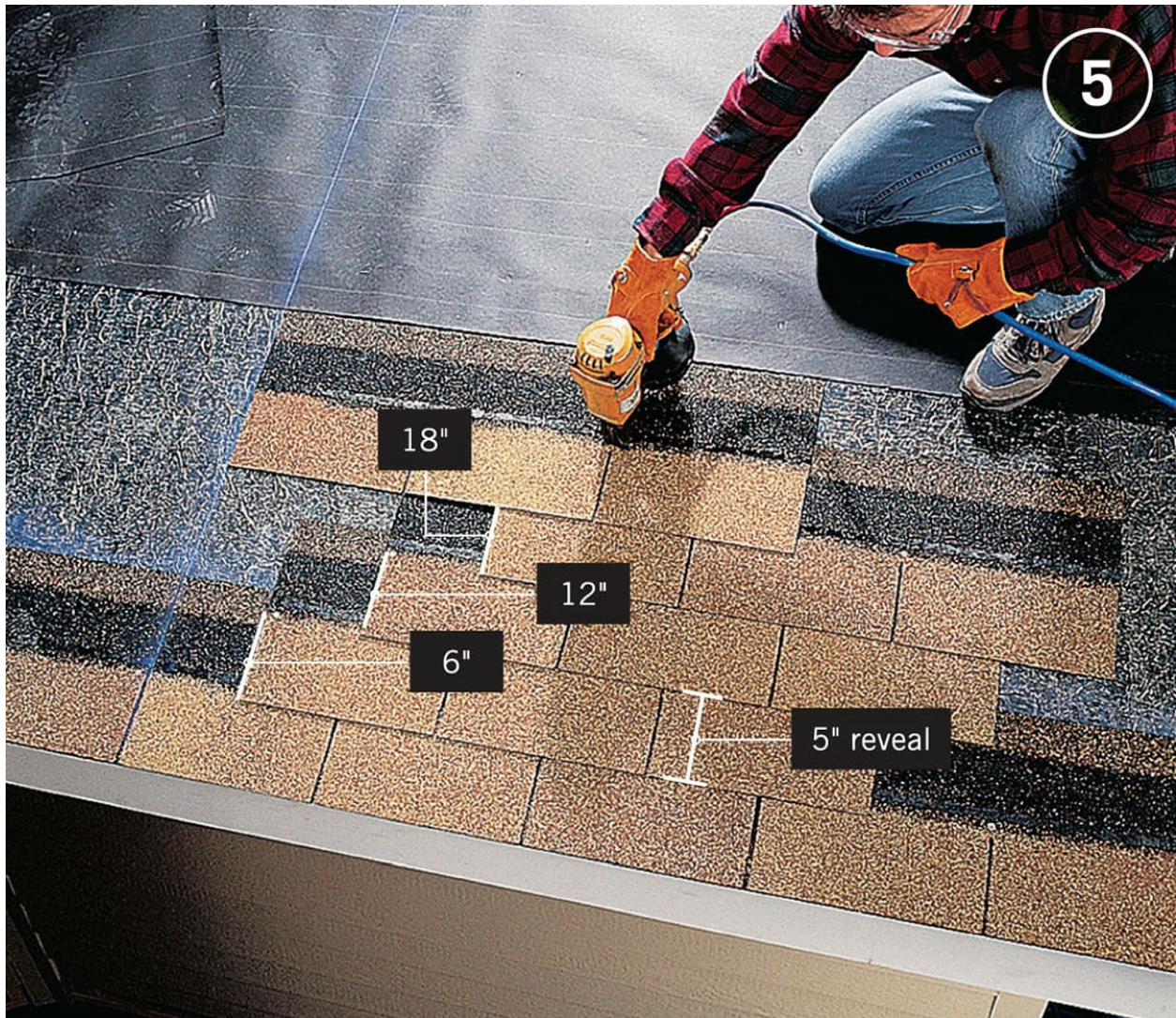
Apply the first full course of shingles over the starter course with the tabs pointing down. Begin at the rake edge where you began the starter row. Place the first shingle so it overhangs the rake edge by  $\frac{3}{8}$ " and the eaves edge by  $\frac{1}{2}$ ". Make sure the top of each shingle is flush with the top of the starter course, following the chalkline.





**Snap a chalkline** from the eaves edge to the ridge to create a vertical line to align the shingles. Choose an area with no obstructions, as close as possible to the center of the roof. The chalkline should pass through a slot or a shingle edge on the first full shingle course. Use a carpenter's square to establish a line perpendicular to the eave edge.





Use the vertical reference line to establish a shingle pattern with slots that are offset by 6" in succeeding courses. Tack down a shingle 6" to one side of the vertical line, 5" above the bottom edge of the first-course shingles to start the second row. Tack down shingles for the third and fourth courses 12" and 18" from the vertical line. Butt the fifth course against the line.





Fill in shingles in the second through fifth courses, working upward from the second course and maintaining a consistent 5" reveal. Slide lower-course shingles under any upper-course shingles left partially nailed, and then nail them down.

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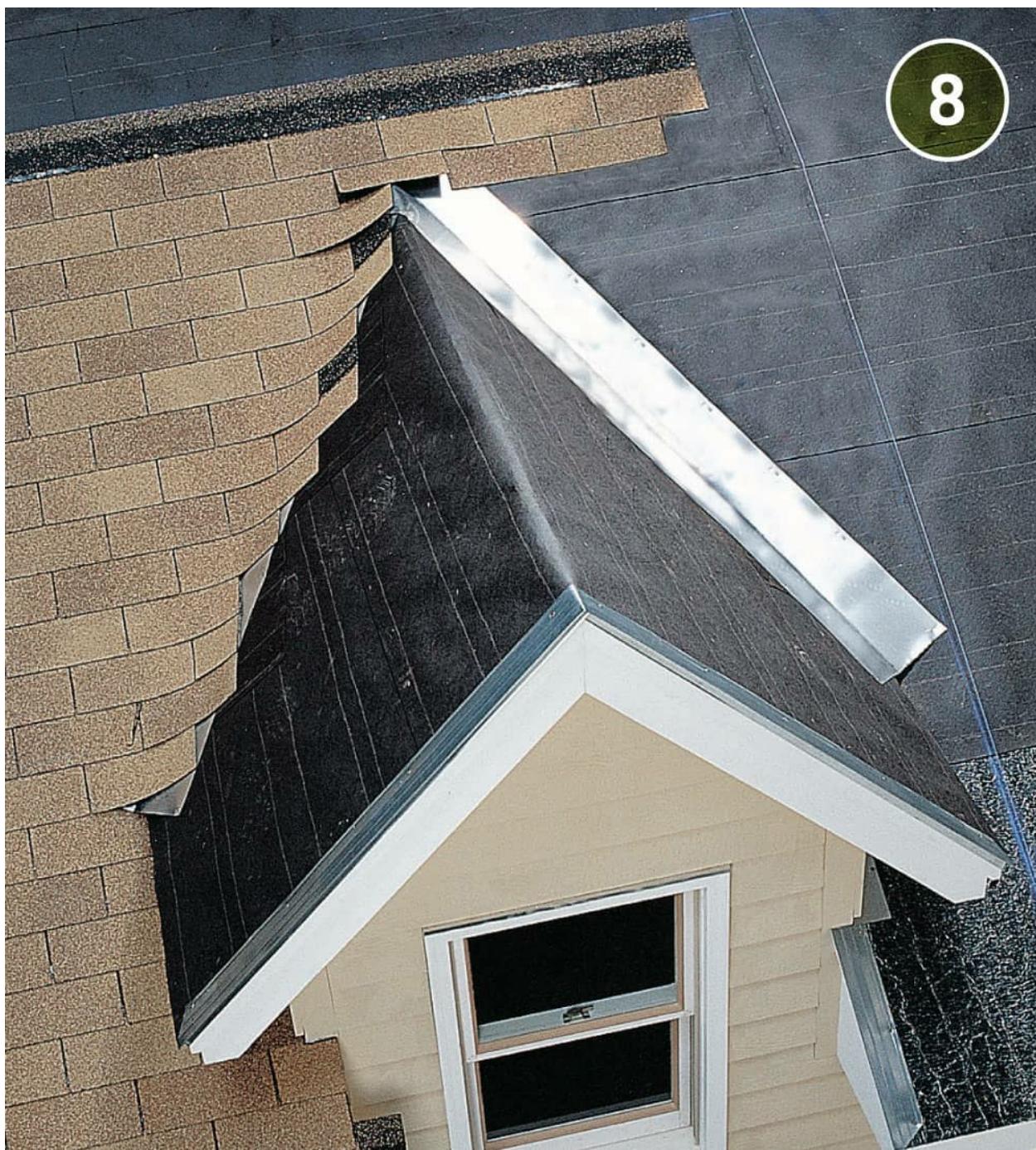
**TIP:** Install roof jacks, if needed, to improve footing after filling out the fifth course.





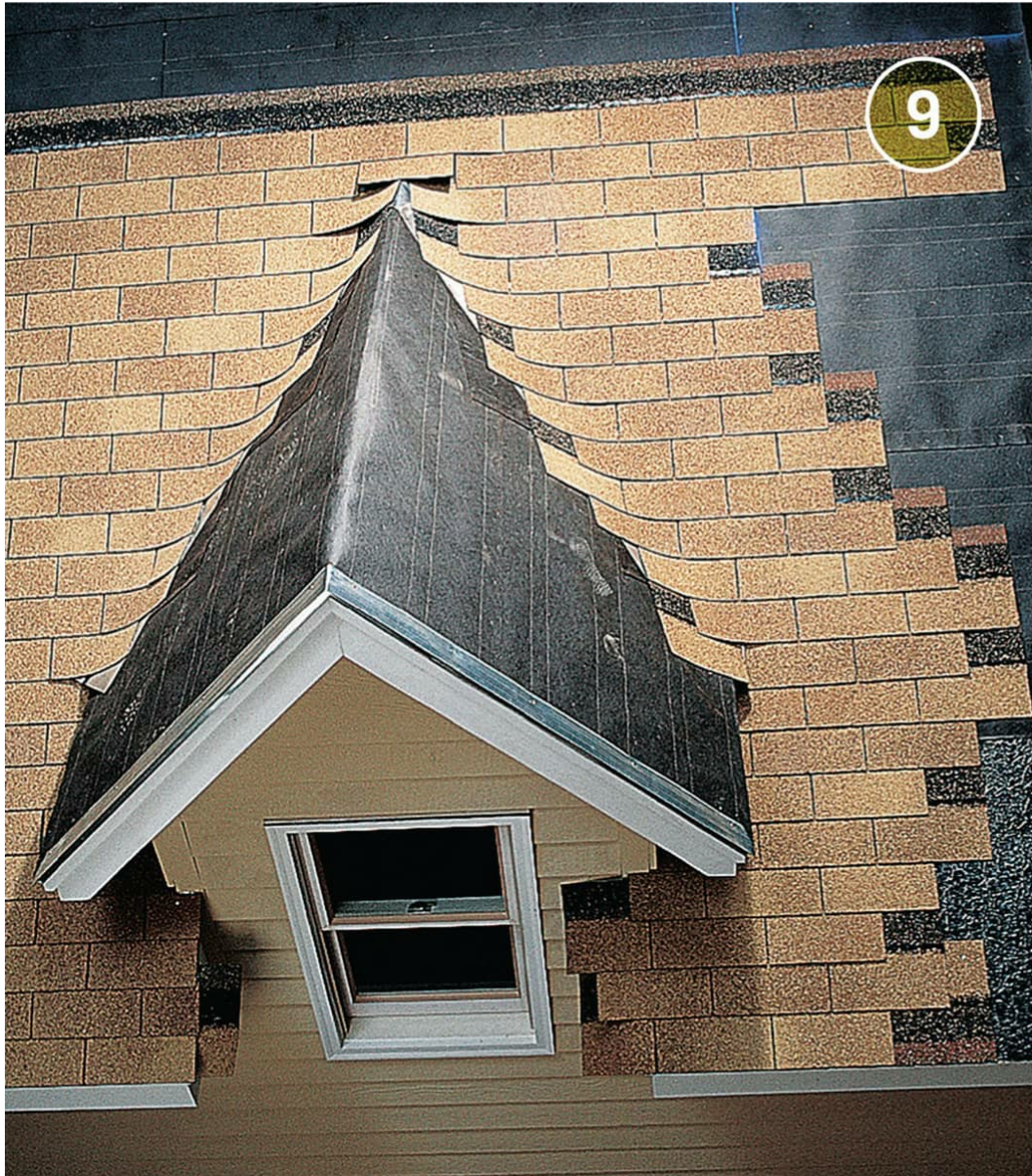
Check the alignment of the shingles after each four-course cycle. In several spots on the last installed course, measure from the bottom edge of a shingle to the nearest felt paper line. If you discover any misalignment, make minor adjustments over the next few rows until it's corrected.





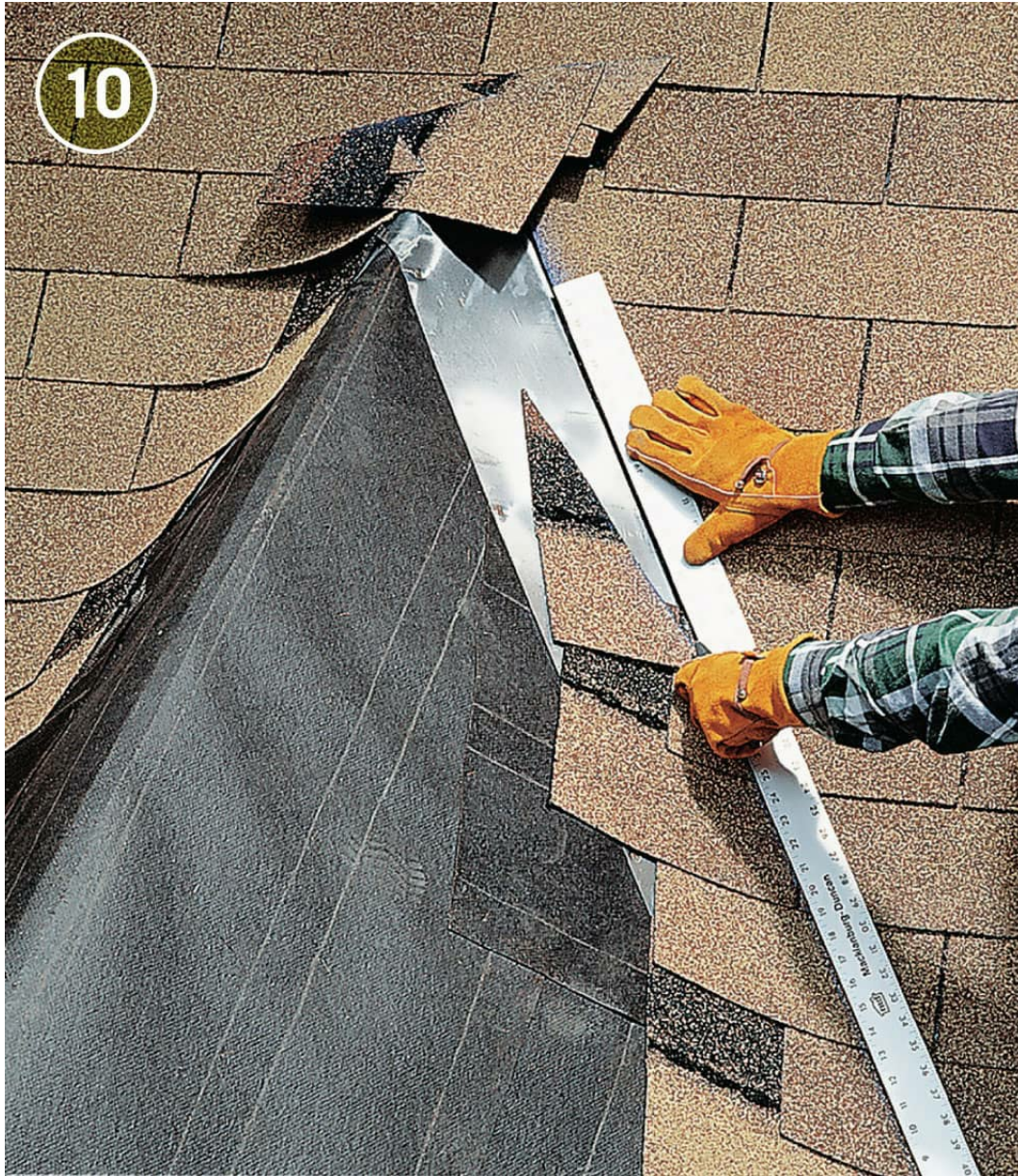
When you reach obstructions, such as dormers, install a full course of shingles above them so you can retain your shingle offset pattern. On the unshingled side of the obstruction, snap another vertical reference line using the shingles above the obstruction as a guide.





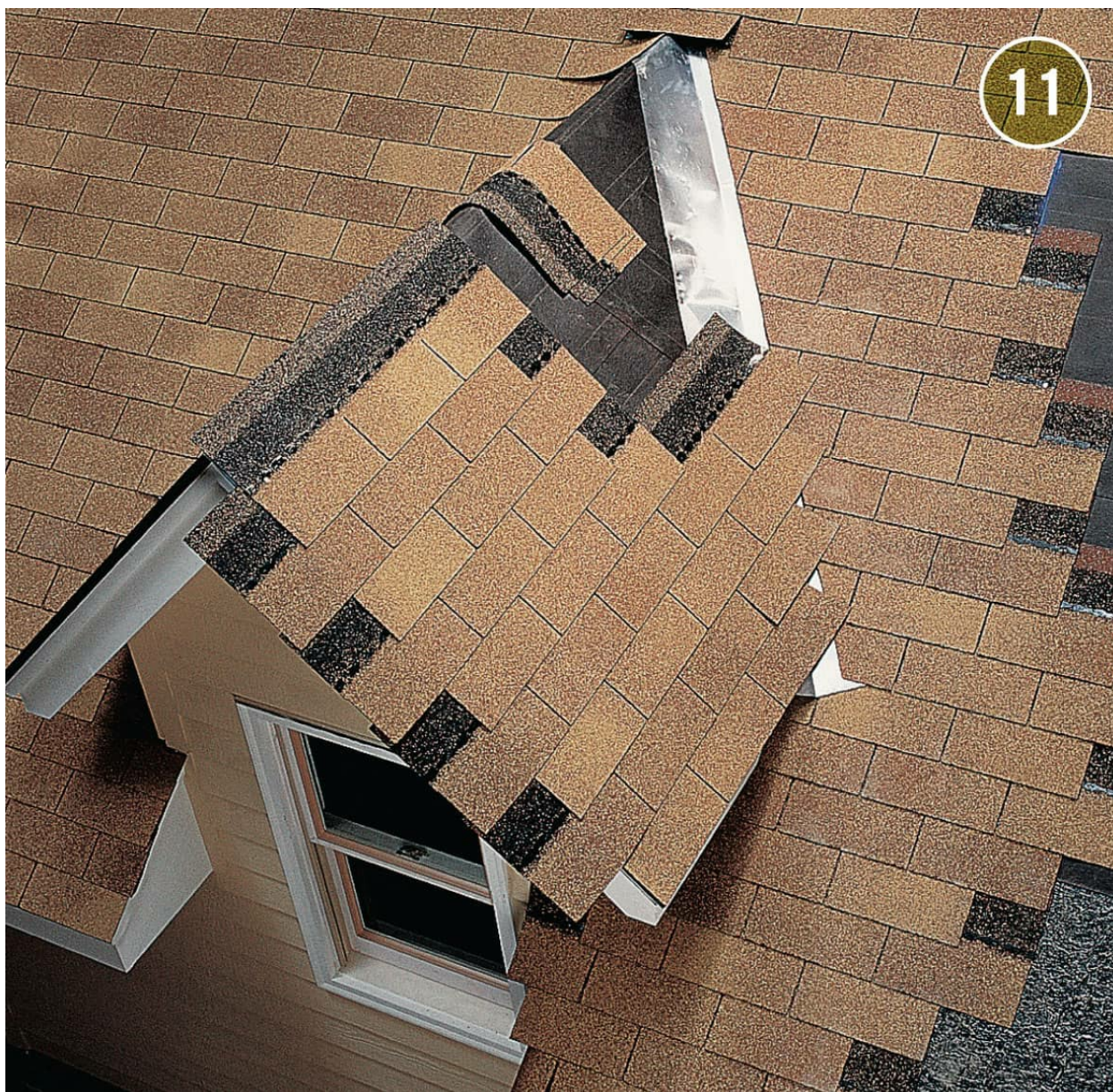
Shingle upward from the eaves on the unshingled side of the obstruction using the vertical line as a reference for re-establishing your shingle slot offset pattern.





Trim off excess shingle material at the V in the valley flashing using a utility knife and straightedge. Do not cut into the flashing. The edges will be trimmed back farther at a slight taper after both roof decks are completely shingled.





Install shingles on adjoining roof decks, starting at the bottom edge, using the same offset alignment pattern shown in steps 1 to 6. Install shingles until courses overlap the center of the valley flashing. Trim shingles at both sides of the valley when finished. Trim shingles overhanging the rake, or trim each with a utility knife and a speed square as you install it.





Install shingles up to the vent pipe so the flashing rests on at least one row of shingles. Apply a heavy double bead of roofing cement along the edges of the flange.



Place a flashing boot over the vent pipe. Position the flashing collar so the longer portion of the tapered neck slopes down the roof and the flange lies over the shingles at the base. Nail the perimeter of the flange using rubber gasket nails.





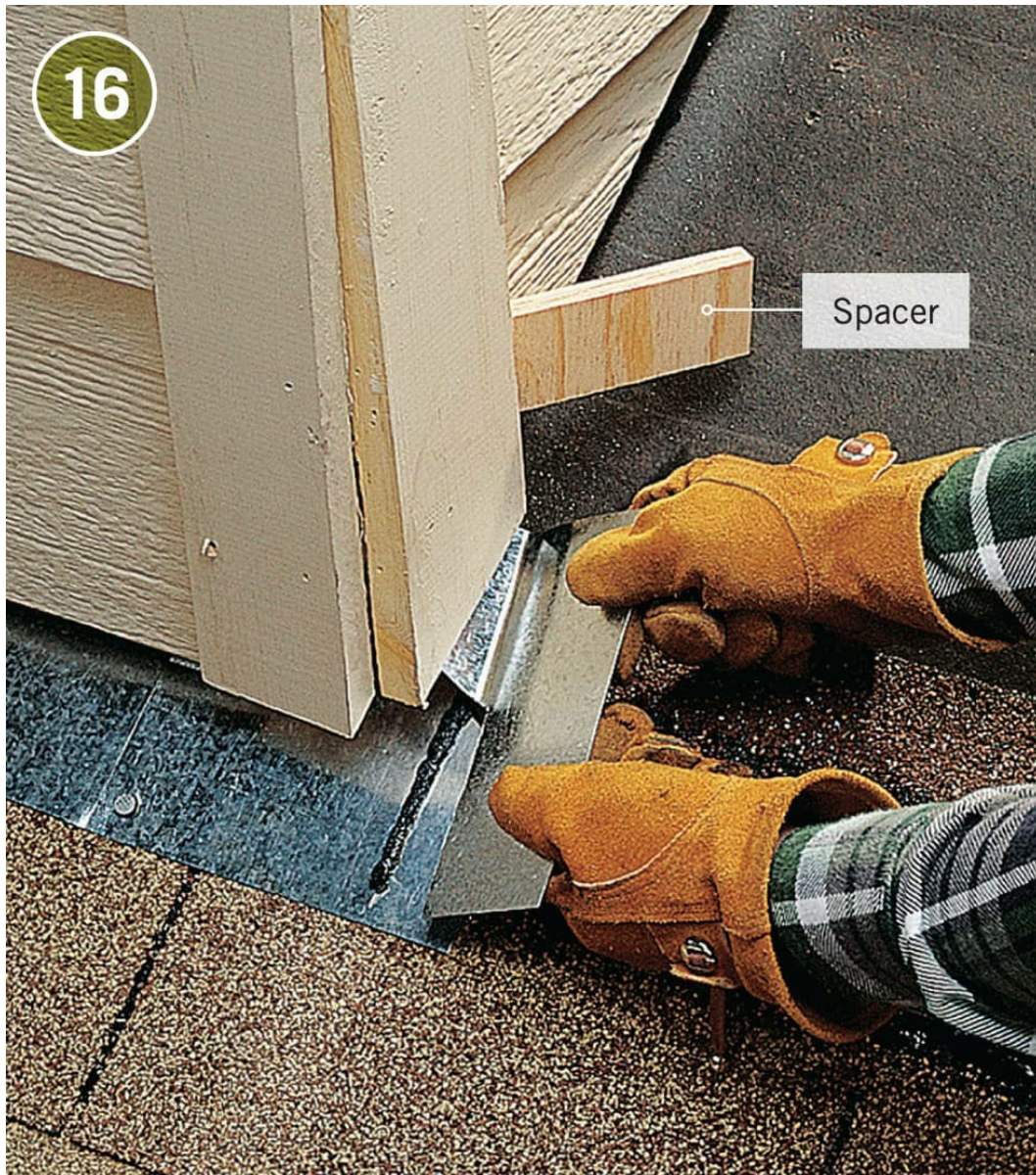
Cut shingles to fit around the neck of the flashing so they lie flat against the flange. Do not drive roofing nails through the flashing. Instead, apply roofing cement to the back of shingles where they lie over the flashing.





Shingle up to an element that requires flashing so the top of the reveal areas are within 5" of the element. Install base flashing using the old base flashing as a template. Bend a piece of step flashing in half and set it next to the lowest corner of the element. Mark a trim line on the flashing, following the vertical edge of the element. Cut the flashing to fit.





**Pry out the lowest courses of siding and any trim at the base of the element.** Insert spacers to prop the trim or siding away from the work area. Apply roofing cement to the base flashing in the area where the overlap with the step flashing will be formed. Tuck the trimmed piece of step flashing under the propped area, and secure the flashing. Fasten the flashing with one rubber gasket nail driven near the top and into the roof deck.





Apply roofing cement to the top side of the first piece of step flashing where it will be covered by the next shingle course. Install the shingle by pressing it firmly into the roofing cement. Do not nail through the flashing underneath.





Tuck another piece of flashing under the trim or siding, overlapping the first piece of flashing at least 2". Set the flashing into roofing cement applied on the top of the shingle. Nail the shingle in place without driving nails through the flashing. Install flashing up to the top of the element the same way. Trim the last piece of flashing to fit the top corner of the element. Reattach the siding and trim.





**Shingle up to the chimney base.** Use the old base flashing as a template to cut new flashing. Bend up the counter flashing. Apply roofing cement to the base of the chimney and the shingles just below the base. Press the base flashing into the roofing cement and bend the flashing around the edges of the chimney. Drive rubber gasket nails through the flashing flange into the roof deck.





Install step flashing and shingles, working up to the high side of the chimney. Fasten flashing to the chimney with roofing cement. Fold down the counter flashing as you go.





Cut and install top flashing (also called a saddle) around the high side of the chimney. Overlap the final piece of flashing along each side. Attach the flashing with roofing cement applied to the deck and chimney and with rubber gasket nails driven through the flashing base into the roof deck. Shingle past the chimney using roofing cement (not nails) to attach shingles over the flashing.





When you reach a hip or ridge, shingle up the first side until the top of the uppermost reveal area is within 5" of the hip or ridge. Trim the shingles along the peak. Install shingles on the opposite side of the hip or ridge. Overlap the peak no more than 5".





Cut three 12"-sq. cap shingles from each three-tab shingle. With the back surface facing up, cut the shingles at the tab lines. Trim the top corners of each square with an angled cut, starting just below the seal strip to avoid overlaps in the reveal area.





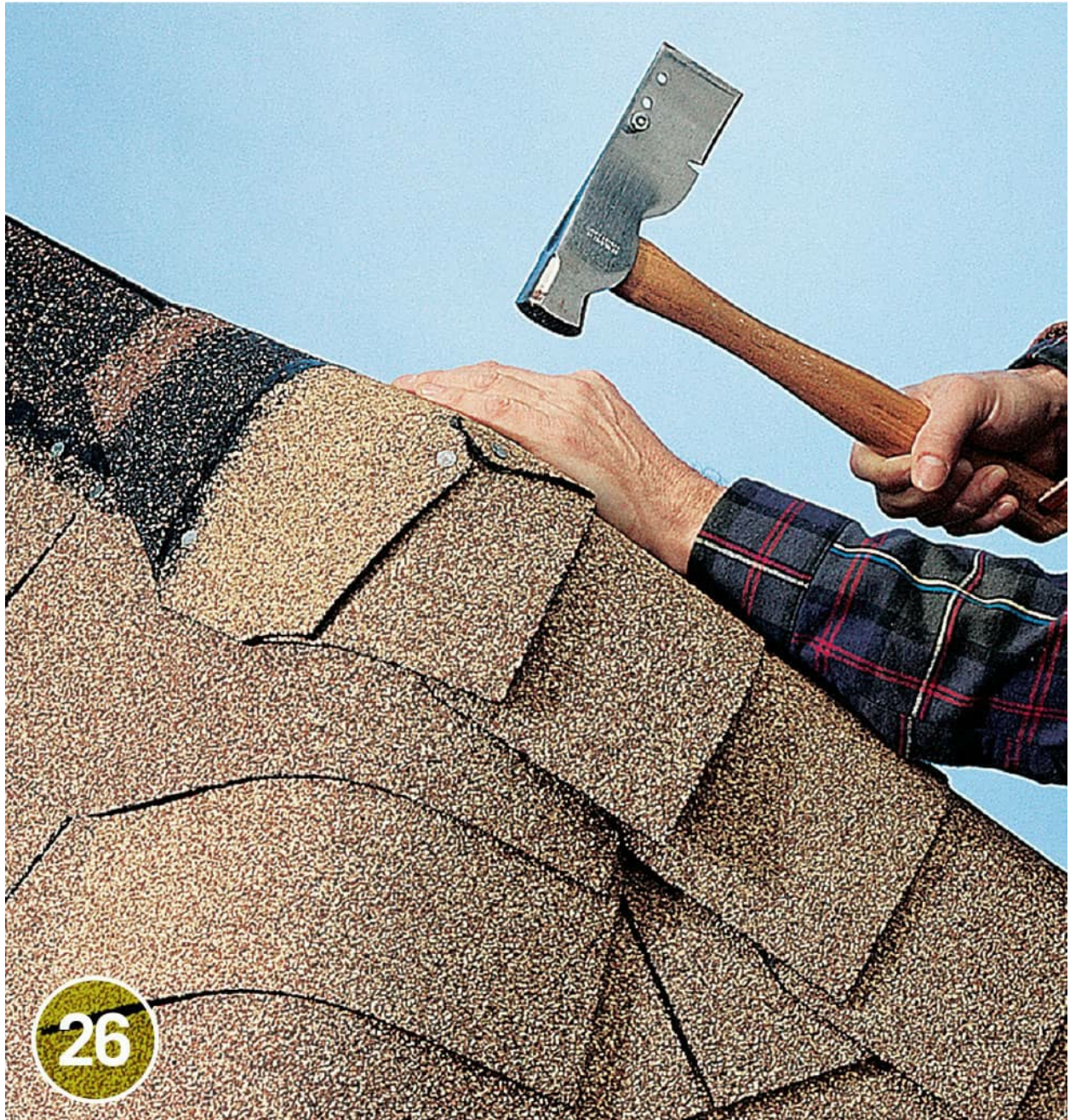
24 Snap a chalkline 6" down from the ridge, parallel to the peak. Attach cap shingles, starting at one end of the ridge, aligned with the chalkline. Drive two 1 $\frac{1}{4}$ " roofing nails per cap about 1" from each edge, just below the seal strip.





Following the chalkline, install cap shingles halfway along the ridge, creating a 5" reveal for each cap. Then, starting at the opposite end, install caps over the other half of the ridge to meet the first run in the center. Cut a 5"-wide section from the reveal area of a shingle tab, and use it as a "closure cap" to cover the joint where the caps meet.





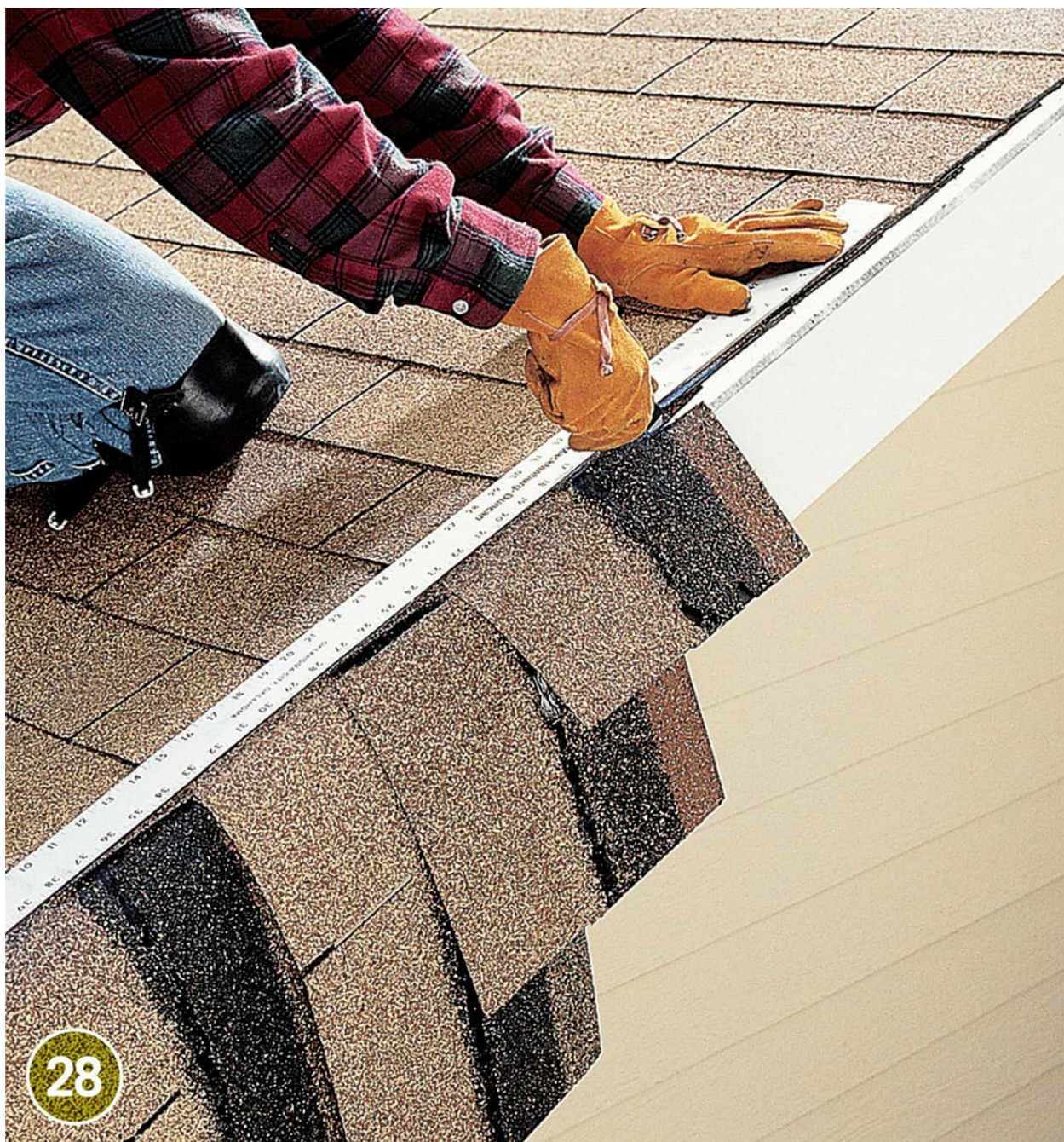
Shingle the hips in the same manner using a chalk reference line and cap shingles. Start at the bottom of each hip and work to the peak. Where hips join with roof ridges, install a custom shingle cut from the center of a cap shingle. Set the cap at the end of the ridge and bend the corners so they fit over the hips. Secure each corner with a roofing nail, and cover the nail heads with roofing cement.





After all shingles are installed, trim them at the valleys to create a gap that's 3" wide at the top and widens at a rate of 1/8" per foot as it moves downward. Use a utility knife and straightedge to cut the shingles, making sure not to cut through the valley flashing. At the valleys, seal the undersides and edges of shingles with roofing cement. Also cover exposed nail heads with roofing cement.





Mark and trim the shingles at the rake edges of the roof. Snap a chalkline  $\frac{3}{8}$ " from the edge to make an overhang, then trim the shingles using a utility knife or an old pair of scissors.



## Ridge Vents

For efficient attic ventilation, installing a continuous ridge vent is a reliable solution. Since they're installed along the entire ridge of the roof, they provide an even flow of air along the underside of the roof decking. Combined with continuous soffit vents, this is the most effective type of roof ventilation system.

Since the vents are installed along the ridge, they don't interrupt the field shingles, eliminating any disruptions to the roof. Other vent types, such as roof louvers and turbines, can distract from the roof's aesthetics.

Installing one continuous ridge vent is quicker and easier than installing other types of vents that need to be placed in several locations across the roof. It also saves you from having to make numerous cuts in your finished roof, which can disturb surrounding shingles.





Continuous ridge vents work in conjunction with the soffits to allow airflow under the roof decking. Installed at the roof peak and covered with cap shingles, ridge vents are less conspicuous than other roof vents.



## TOOLS & MATERIALS

- Hammer
- Circular saw
- Tape measure
- Chalkline
- Flat pry bar
- Ridge vents
- 1 1/2" roofing nails

## How to Install a Ridge Vent

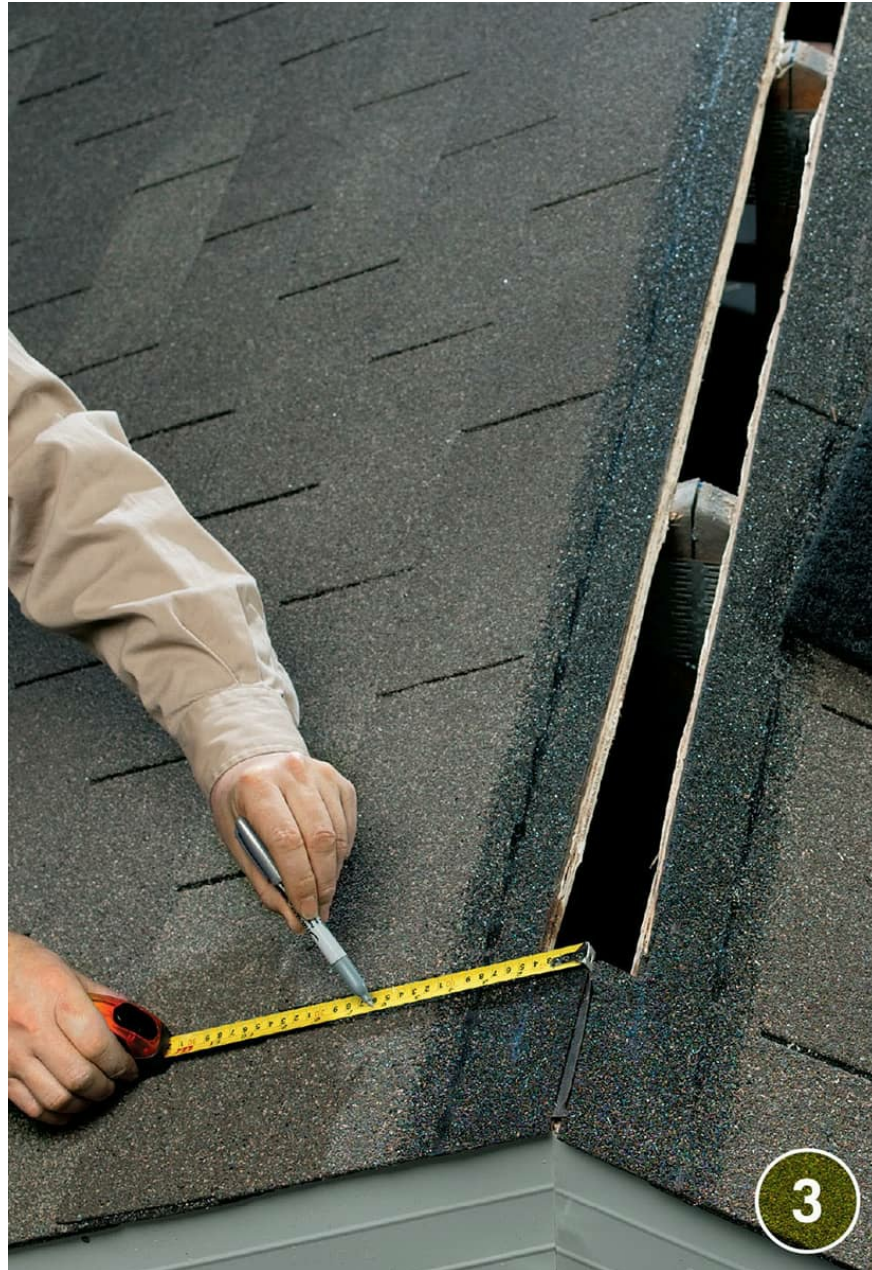


Remove the ridge caps using a flat pry bar. Measure down from the peak the width of the manufacturer's recommended opening, and mark each end of the roof. Snap a chalkline between the marks. Repeat for the other side of the peak. Remove any nails in your path.



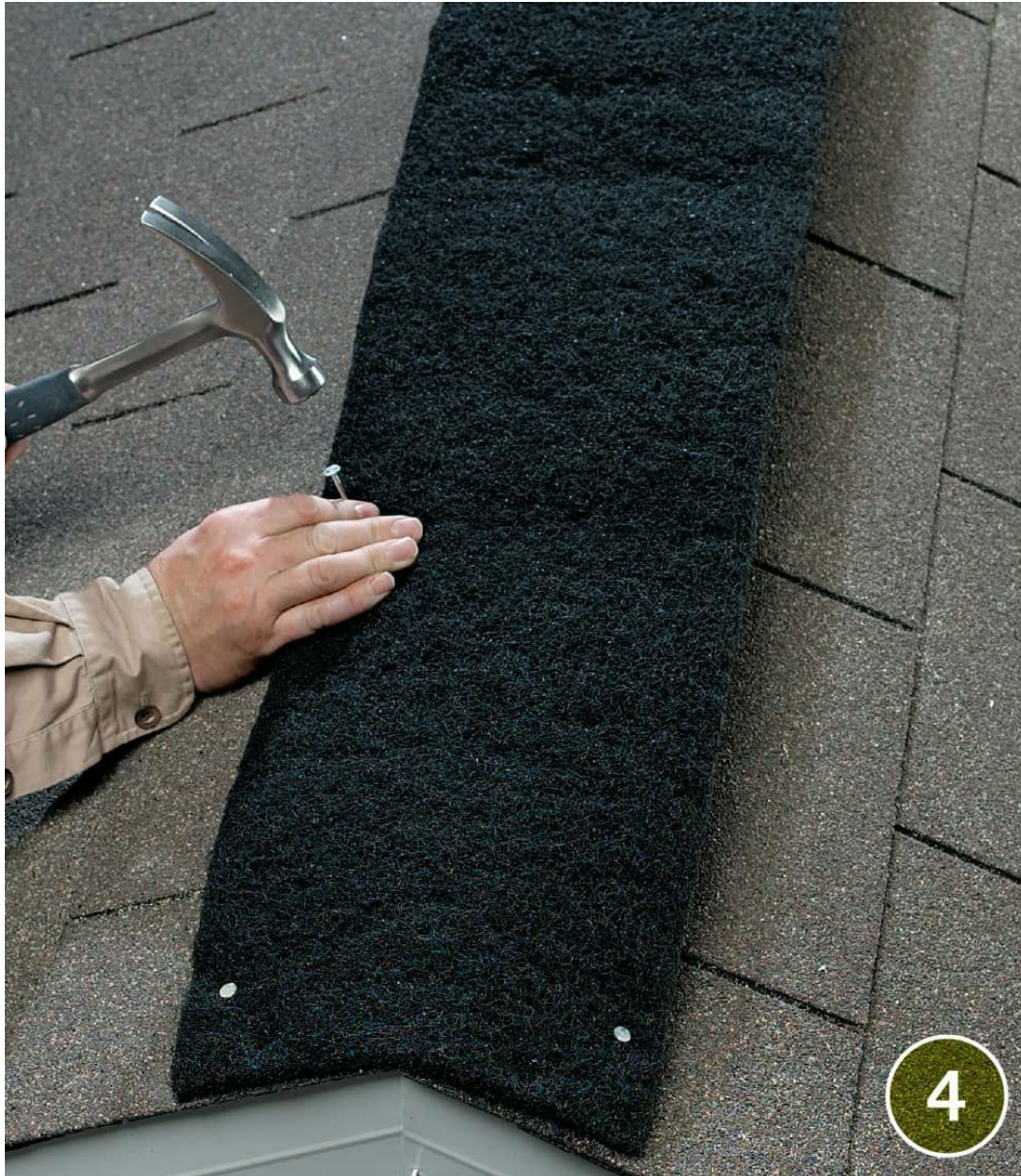


Set the blade depth of a circular saw to cut the sheathing but not the rafters. Cut along each chalkline, staying 12" from the edges of the roof. Remove the cut sheathing using a pry bar. If you have a long ridge, spare your saw blade by first cutting away the roofing with a utility knife.



Measure down from the peak half the width of the ridge vent, and make a mark on both ends of the roof. Snap a line between the marks. Do this on both sides of the peak.



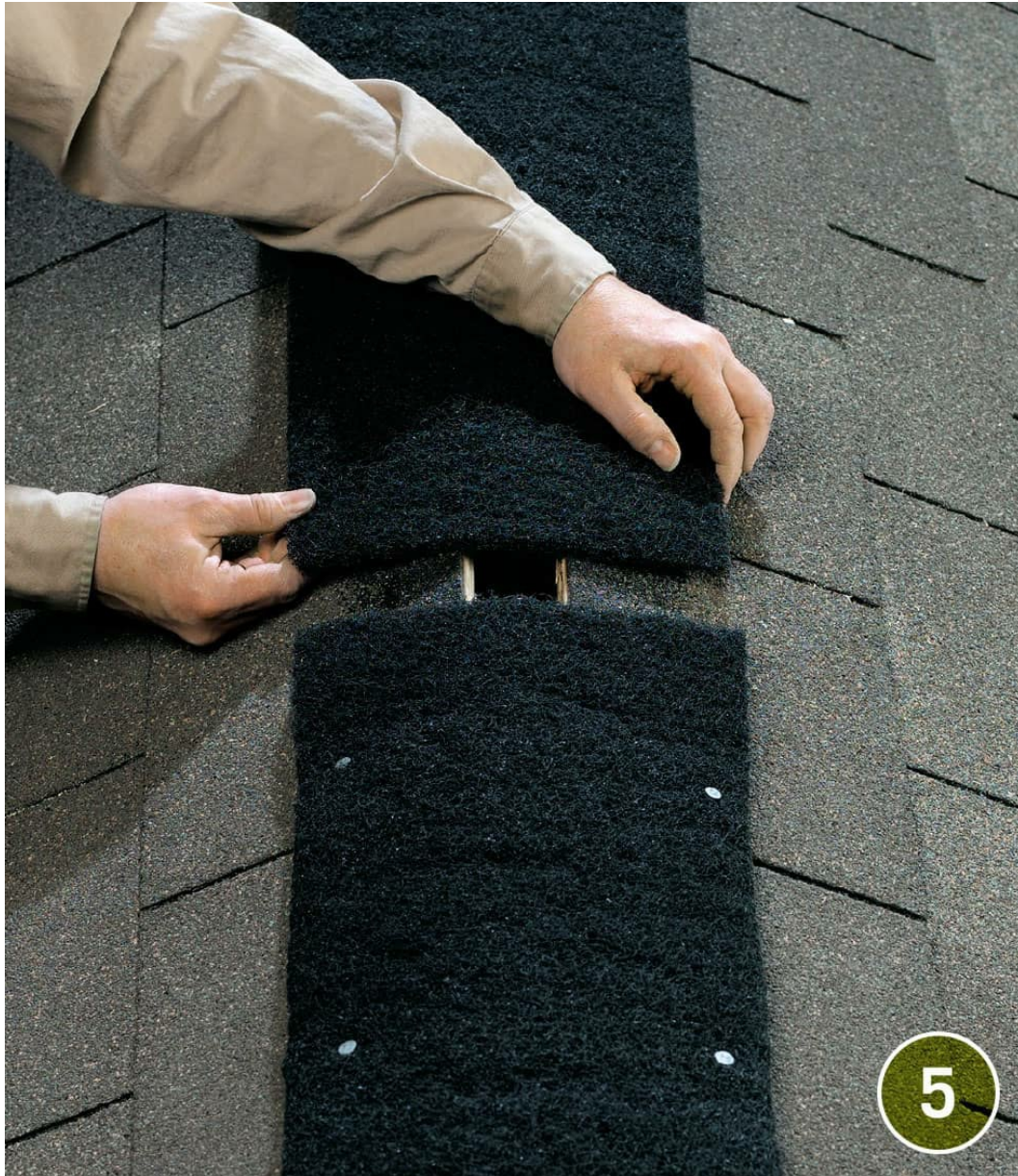


Center the ridge vent over the peak, aligning the edges with the chalklines. Install using roofing nails that are long enough to penetrate the roof sheathing.

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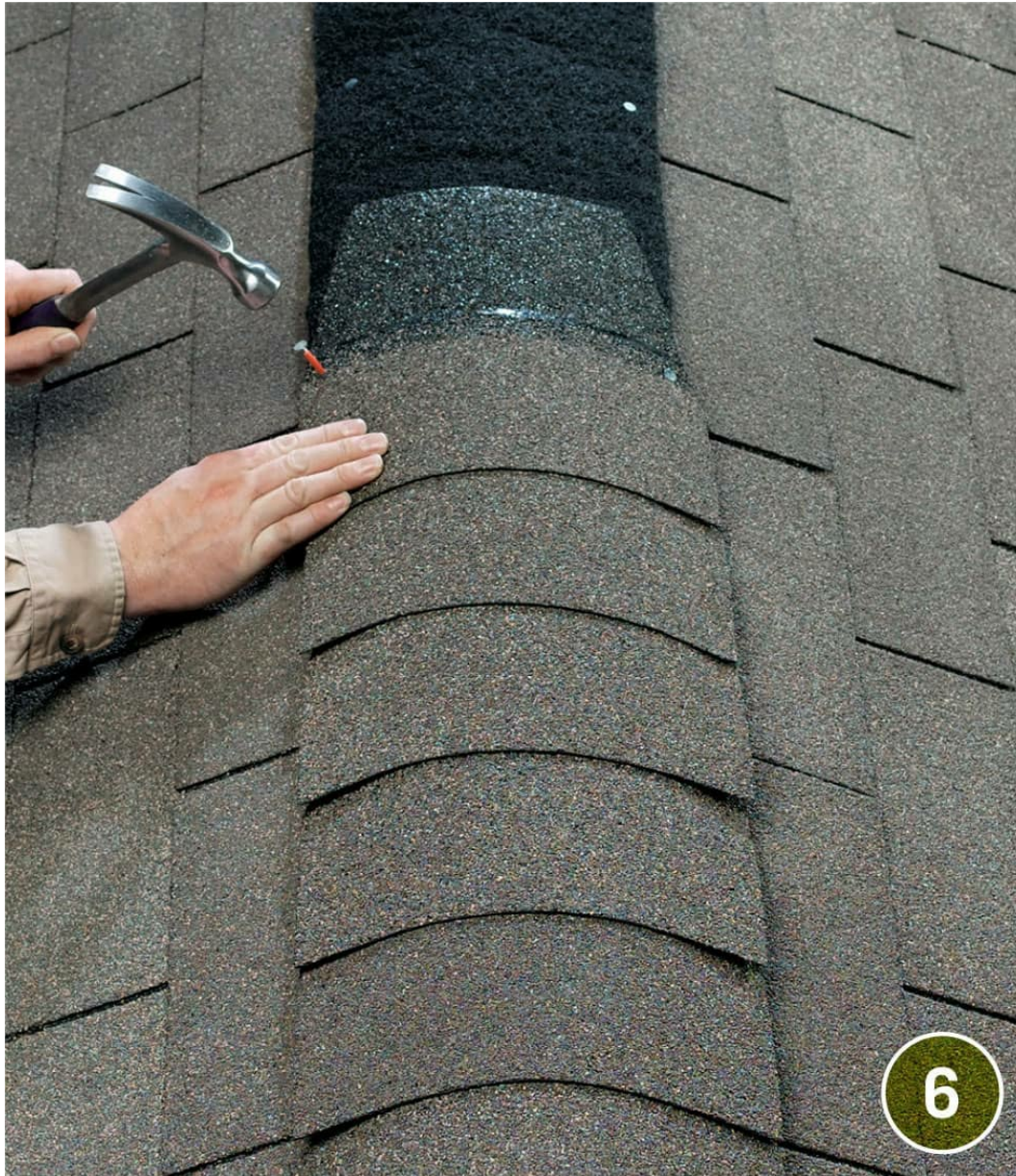
**TIP:** If a chimney extends through the peak, leave 12" of sheathing around the chimney.





Butt sections of ridge vents together and nail the ends. Install vents across the entire peak, including the 12" sections at each end of the roof that were not cut away.





Place ridge cap shingles over the ridge vents. Nail them with two 1½" roofing nails per cap. Overlap the caps as you would on a normal ridge. If the caps you removed in step 1 are still in good shape, you can reuse them. Otherwise, use new ones.



## Cedar Shakes

Cedar shakes (which are thick and rough) and shingles (which are tapered and smooth) are installed in much the same way, with one major difference. Shakes have felt paper installed between each course, while shingles do not. Shingles are often applied over open sheathing, while shakes are installed over open or solid sheathing. Air circulation under shakes and shingles can increase their life span. Check your local building codes to see what type of sheathing is recommended for your area.

The gaps between shakes and shingles, called joints, are specified by the manufacturer. You can determine how much of the material to leave exposed below the overlap, as long as it falls within the manufacturer's guidelines.



### TOOLS & MATERIALS

Roofer's hatchet

Tape measure

Utility knife

Stapler

Chalkline

Circular saw

Jigsaw

Caulk gun

Shakes

Flashing

Nails



30# building paper  
Mason's string  
Roofing cement



Cedar shakes are an attractive choice that has lately fallen out of favor because of high cost and maintenance challenges. Added to their premium price is a boost in insurance costs because in some regions they are considered a fire hazard.



## Cedar Shakes & Shingles



Wood shakes and shingles are available in different grades. Some of the more popular include resawn shake (A), No. 1 hand-split medium shake (B), standard-grade shake (C), taper-sawn shake (D), No. 1 heavy shake (E), pressure-treated medium shake (F), No. 2 shingle (G), undercoursing shingle (H), No. 1 shingle (I).

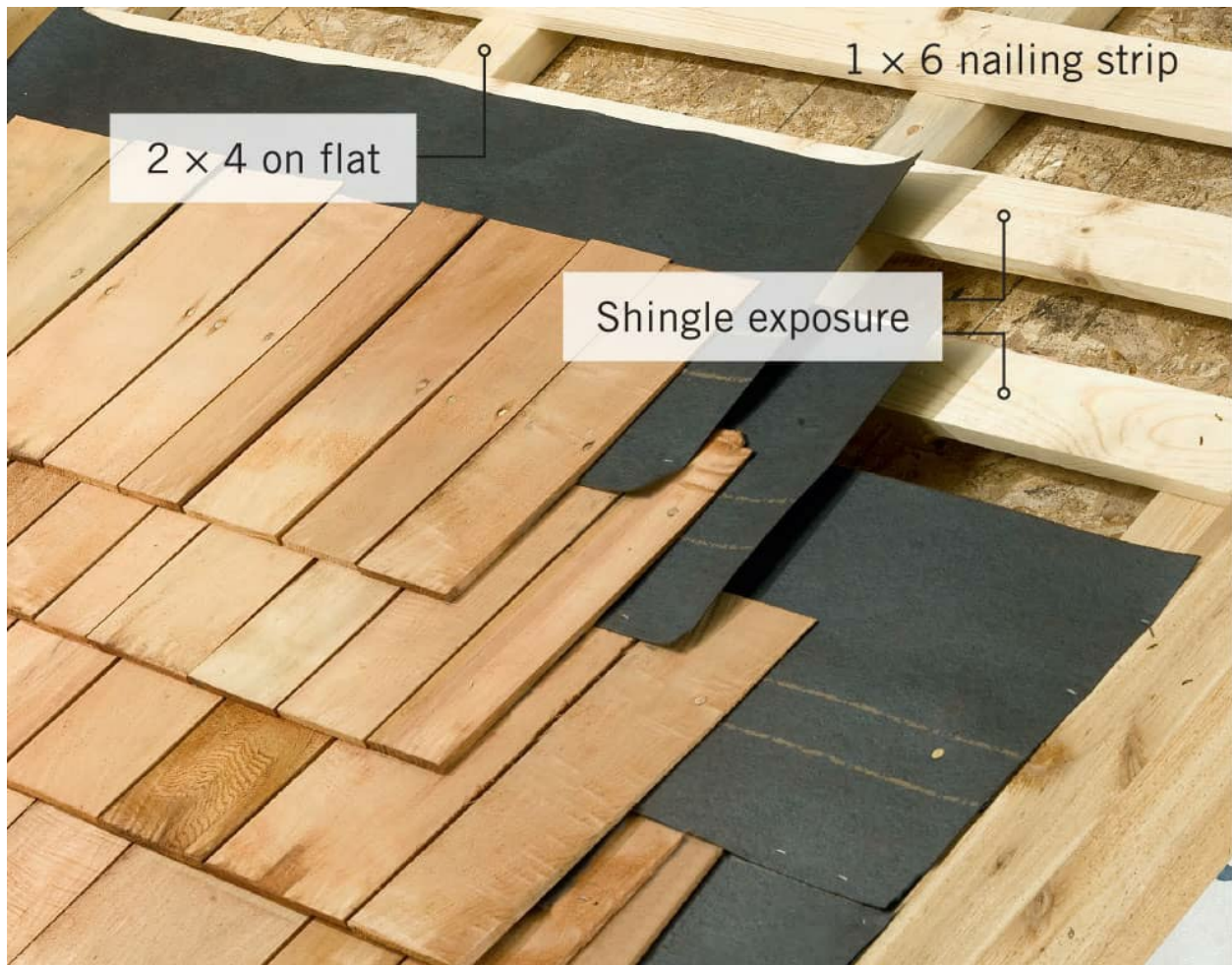




## Underlayment for Cedar Shakes & Shingles



Spaced sheathing is common, and sometimes required, for cedar shakes and shingles. Solid sheathing is installed along the eaves and rake ends, and open-spaced wood strips are installed in the field to allow for air circulation.



To install spacer strips over solid sheathing, place 2 × 4s flat over each rafter and nail them to the roof. Nail 1 × 4 or 1 × 6 nailing strips across the 2 × 4s. Keep the strips together along the eaves, then space them at a distance equal to the exposure rate in the field.



# How to Install Cedar Shakes



Prepare the roof decking by installing valley flashing at all valleys (shown [here](#)). Apply building paper underlayment to the first 36" of the roof deck.

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**NOTE:** Depending on your climate and building codes, you may need to install ice and water shield for this step rather than felt paper.



Install a starter shake so it overhangs the eaves and rake edge by 1½". Do the same on the opposite side of the roof. Run a taut string between the bottom edges of the two shakes. Install the remaining shakes in the starter row, aligning the bottoms with the string. Keep the manufacturer's recommended distance between shakes, usually 3/8 to 5/8".

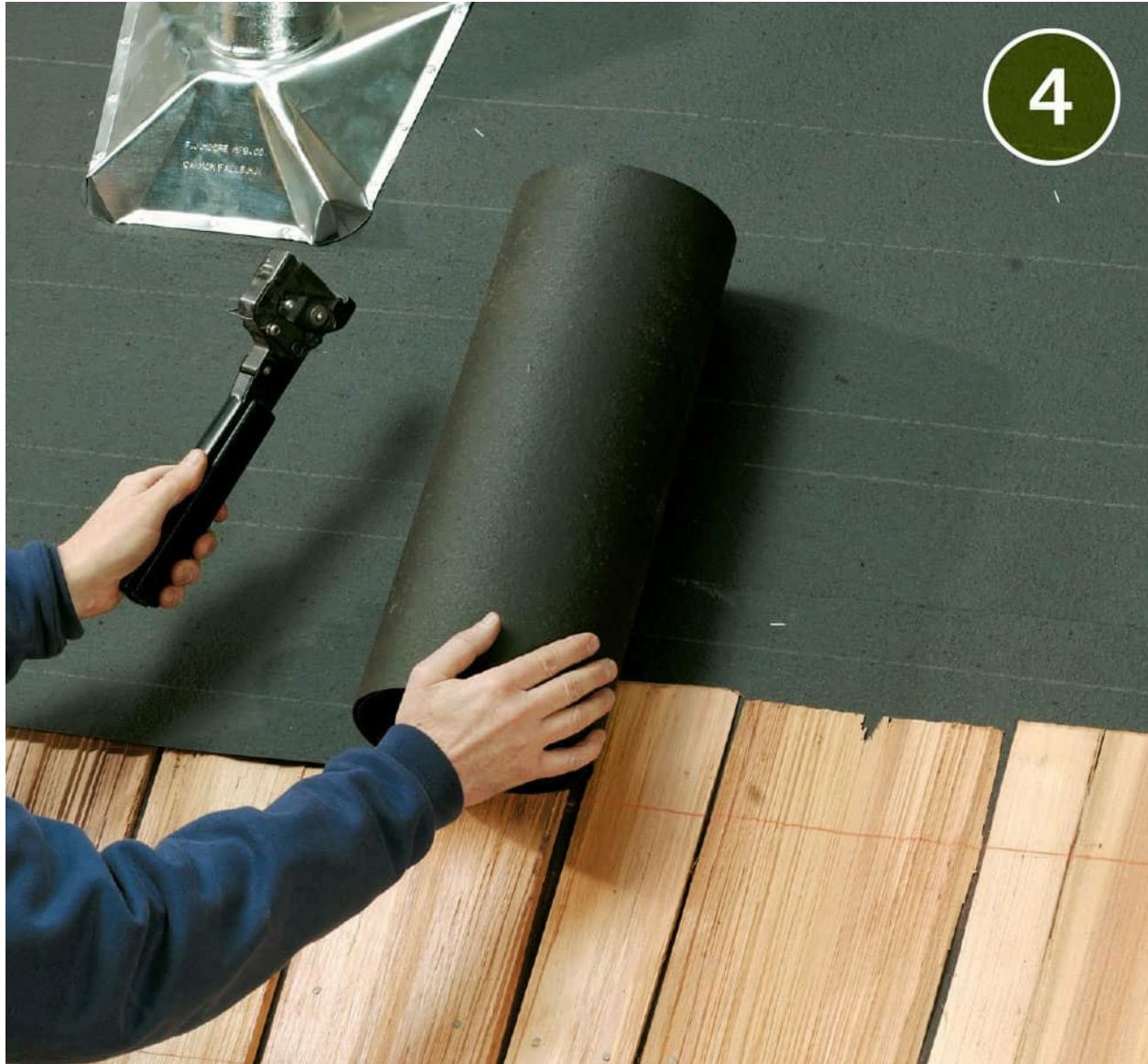




Set the first course of shakes over the starter row, aligning the shakes along the rake ends and bottoms. Joints between shakes must overlap by at least 1½". Drive two nails in each shake, ¾ to 1" from the edges, and 1½ to 2" above the exposure line. Use the hatchet to split shakes to fit.

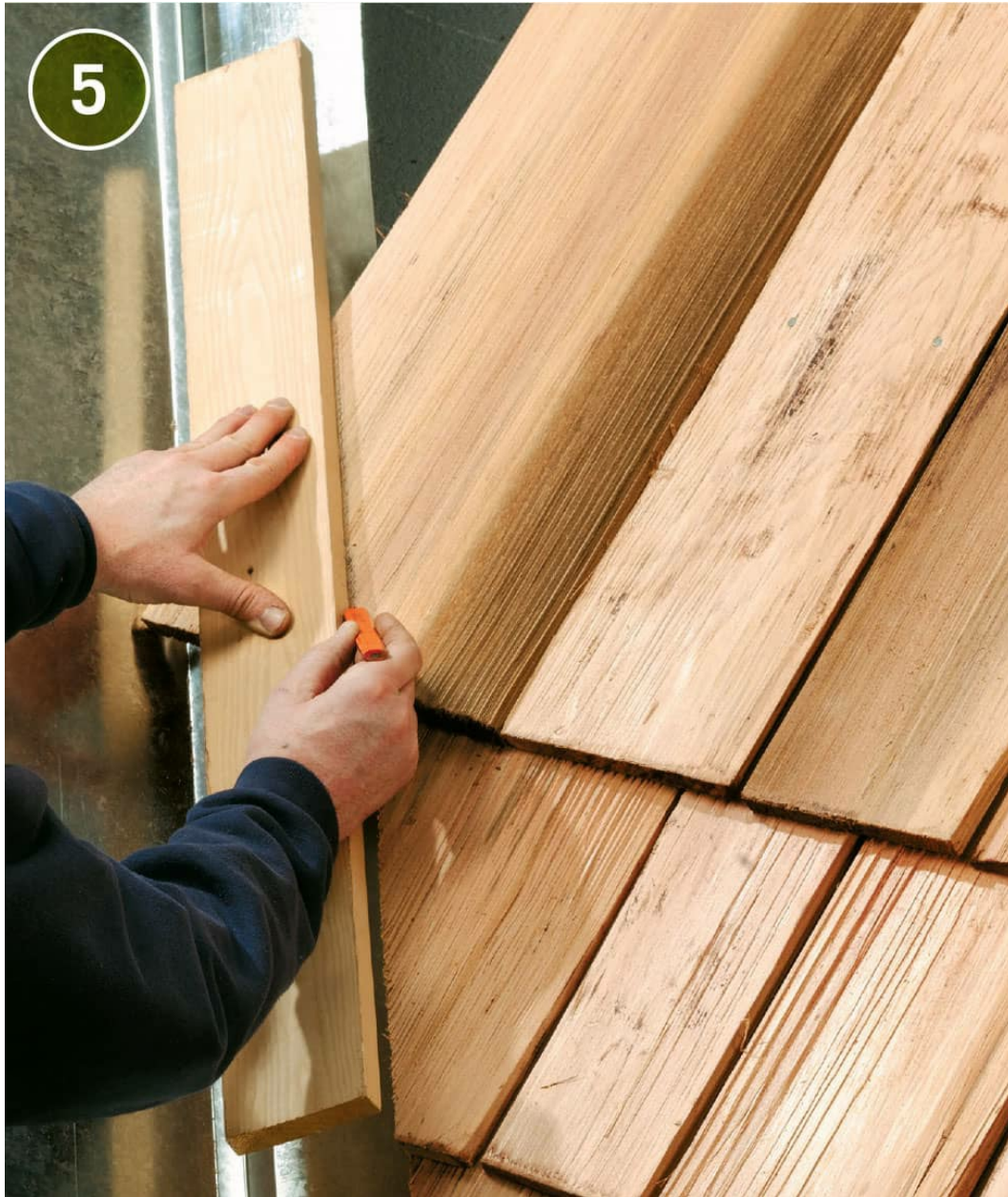
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**TIP:** Set the gauge on your roofer's hatchet to the exposure rate. You can then use the hatchet as a quick reference for checking the exposure.

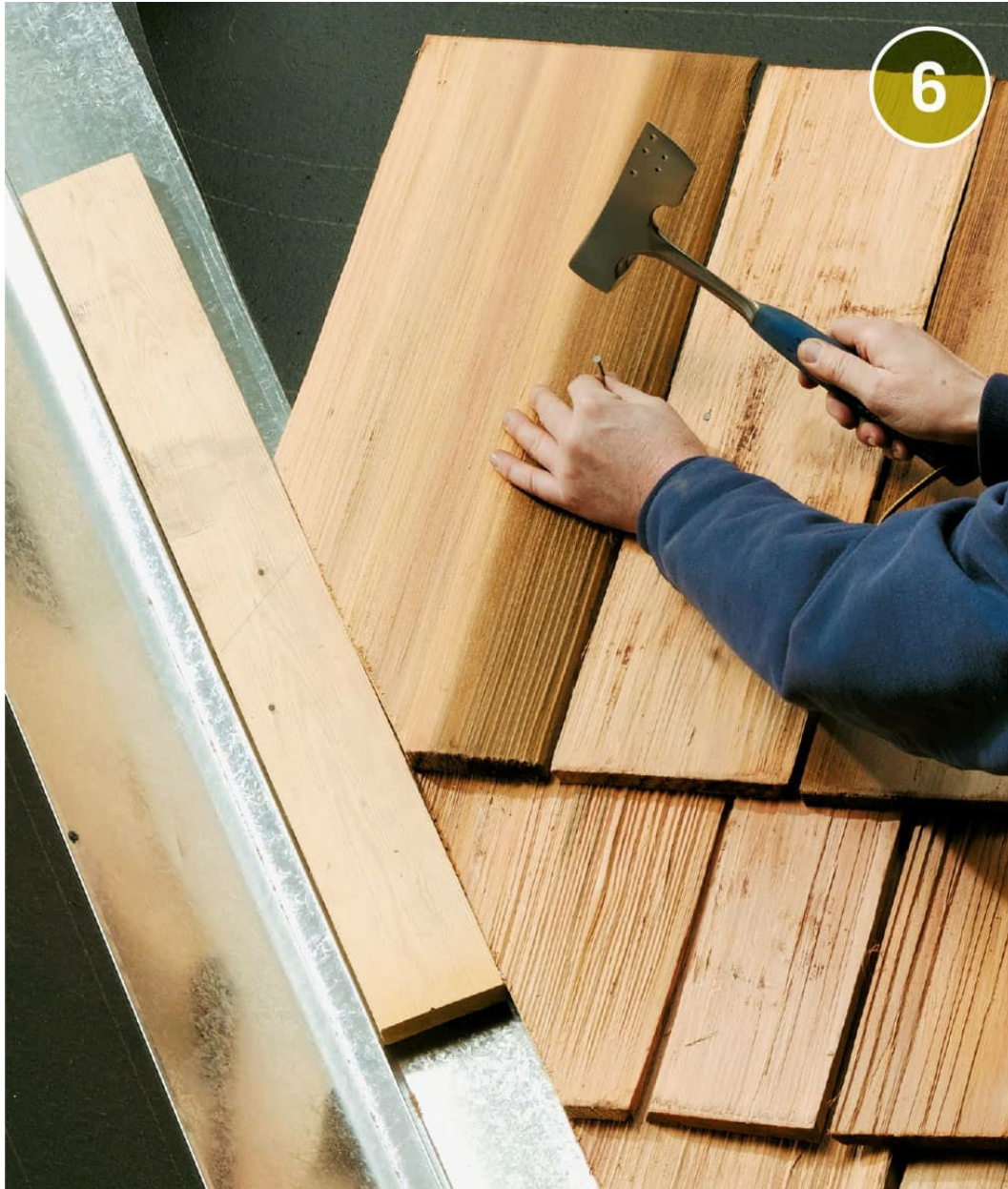


Snap a chalkline over the first course of shakes at the exposure line. Snap a second line at a distance that's twice the exposure rate. Staple an 18"-wide strip of felt paper at the second line. Overlap felt paper vertical seams by 4". Install the second course of shakes at the exposure line, offsetting joints by 1½" minimum. Install remaining courses the same way.





Set shakes in place along valleys, but don't nail them. Hold a 1 × 4 against the center of the valley flashing without nailing it. Place it over the shakes to use as a guide for marking the angle of the valley. Cut the shakes using a circular saw, then install.



Use the 1 × 4 to align the edge of the shakes along the valley. Keep the 1 × 4 butted against the valley center, and place the edge of the shake along the edge of the board. Avoid nailing through the valley flashing when installing the shakes.





Notch shakes to fit around a plumbing stack using a jigsaw, then install a course of shakes below the stack. Apply roofing cement to the underside of the stack flashing, then place it over the stack and over the shakes. Nail the flashing along the edges.



Overlap the exposed flashing with the next row of shakes. Cut notches in the shakes to fit around the stack, keeping a 1" gap between the stack and shakes.



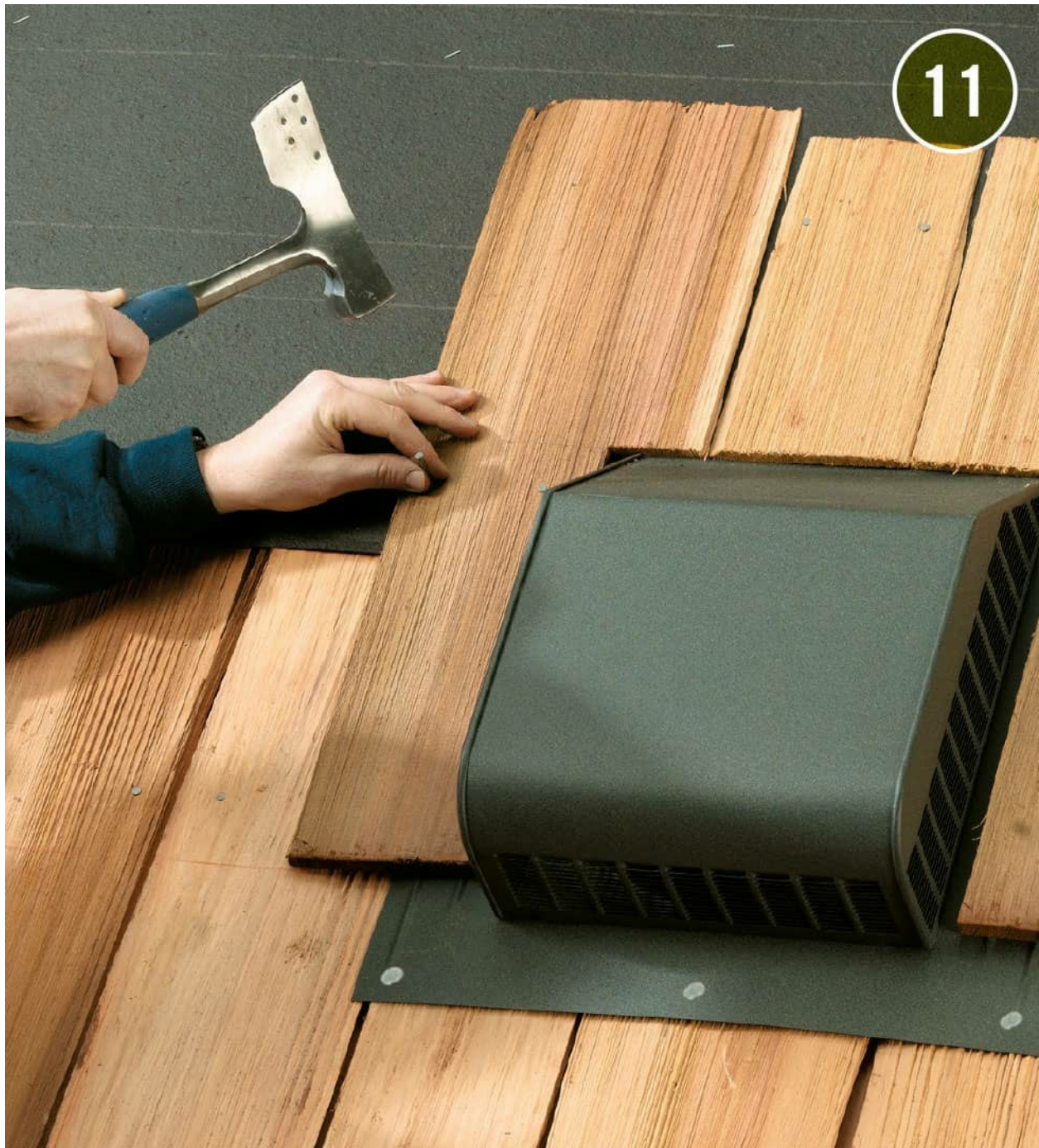


**Install shakes under the bottom apron flashing beneath a skylight. Cut the shakes as necessary. Nail the shakes without driving nails through the flashing. Apply roofing cement to the underside of the flashing, then press to the shakes.**



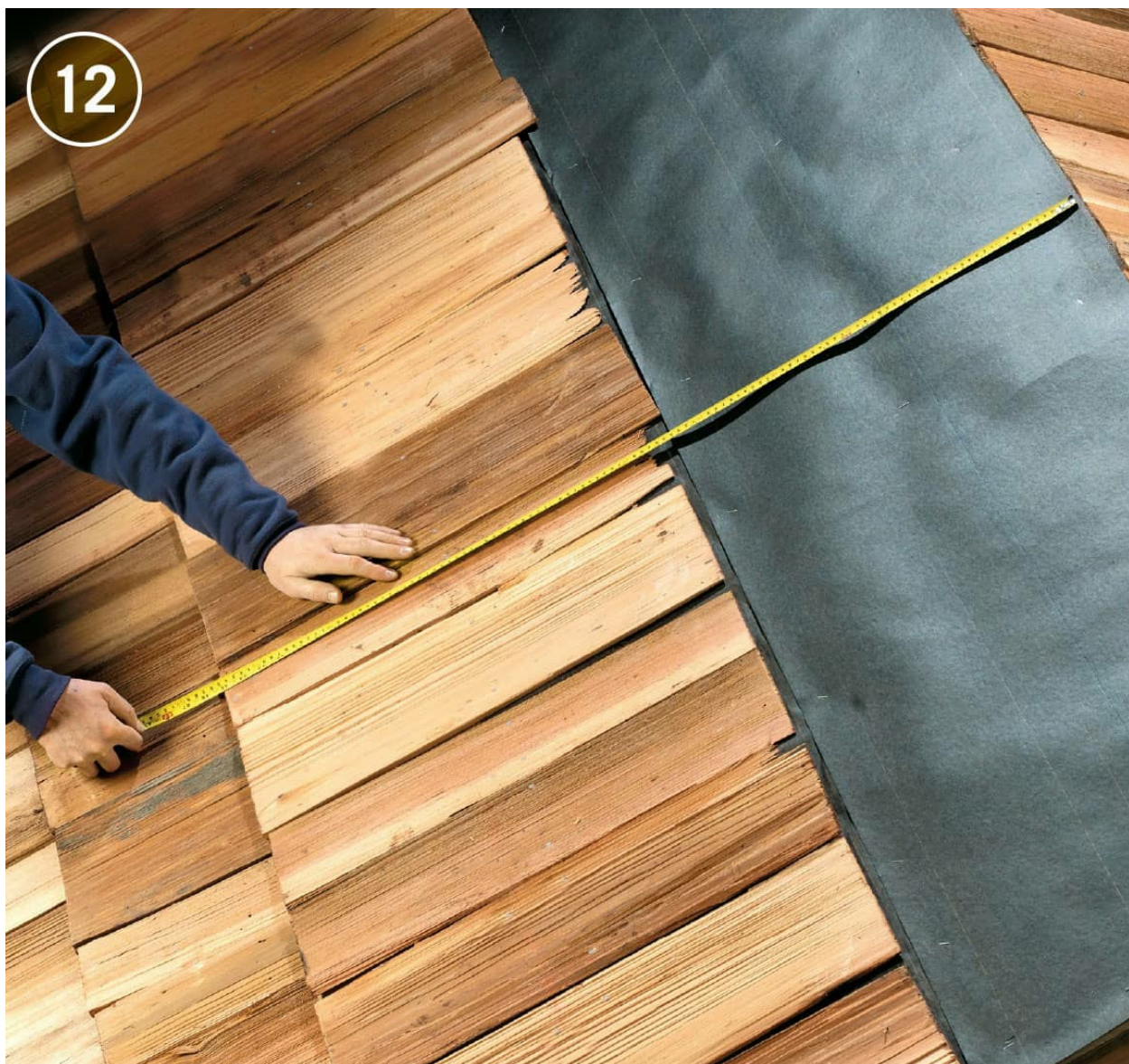
**Interweave skylight flashing along the skylight with rows of shakes.** After each row of shakes, install a piece of flashing with the vertical plane placed under the edge lip of the skylight and the horizontal plane flush with the bottom edge of the shake. A row of shakes covers the top apron flashing.





Apply roofing cement along the underside of the roof louver flange, then set it over the vent cutout and over the shakes directly below it. Nail the louver in place. Install shakes over the sides and back of the louver, trimming to fit as needed.





As you approach the ridge, measure from the last installed row to the peak. Do this on each side of the roof. If the measurements are not equal, slightly adjust the exposure rate in successive rows until the measurements are the same. Make sure you're measuring to points that are aligned at the peak. The top of the sheathing is probably not level across the roof and cannot be a reference point.





Run shakes past the roof peak. Snap a chalkline across the shakes at the ridge. Set the circular saw blade to the depth of the shakes, then cut along the chalkline.





Cut 8" strips of felt paper and staple them over the hips and ridge. Set a factory-made hip and ridge cap at one end of the ridge, aligned with the roof peak. Do the same at the other end of the roof. Snap a chalkline between the outside edges of the caps.





Set a ridge cap along the chalkline flush with the edge of the roof to serve as the starter. Install with two nails. Place a cap directly on top of the starter cap, and nail in place. Install caps along the remainder of the ridge, alternating the overlap pattern. The exposure rate should be the same as the roof shakes. Nails should penetrate the roof decking by  $\frac{1}{2}$ ".



**VARIATION:** If the ridge caps are not preassembled by the manufacturer, install the first cap along the chalkline, then place the second cap over the edge of the first. Alternate the overlap pattern across the ridge.





## Roll Roofing

**R**oll roofing is a quick and easy roofing product to install. In the most simple installation, the material is rolled across the roof, nailed along the edges, and sealed with roofing cement. It's geared for roofs with slight slopes, such as porches and garages.

Some manufacturers recommend using a roof primer prior to installing the roofing. Read and follow manufacturer's directions. Your roof decking must be completely clean before the roll roofing can be applied. Any debris, even a small twig or leaf, can end up showing through the roofing.

Store the roofing in a warm, dry location until you're ready to start the project, and choose a warm day for the installation. Roll roofing is best installed in temperatures above 45°F. If applied in cold weather, the material can crack.

The following pages show the four methods for installing roll roofing. The perimeter bond application is the fastest installation method and can be used on sloped roofs. The concealed nail application is best for roofs with a slighter pitch all the way down to a 1-in-12 slope, because it prevents water from penetrating under the nail heads. The double coverage method is used for roofs that are almost completely flat. The double coverage, using fully bonded selfedge roofing, offers better protection against water infiltration. The last method is self-adhesive roll roofing. Self-adhesive roll roofing is installed in much the same way as double coverage bonded roll roofing.



## TOOLS & MATERIALS

Utility knife  
Tape measure  
Chalkline  
Serrated trowel  
Straightedge  
Hammer  
Roll roofing  
Galvanized roofing nails  
Asphalt-based roofing cement  
Weighted roller



**Roll roofing** is used on roofs that have a slight slope. Installation is fast and straightforward, with the material rolled over a clean roof decking.

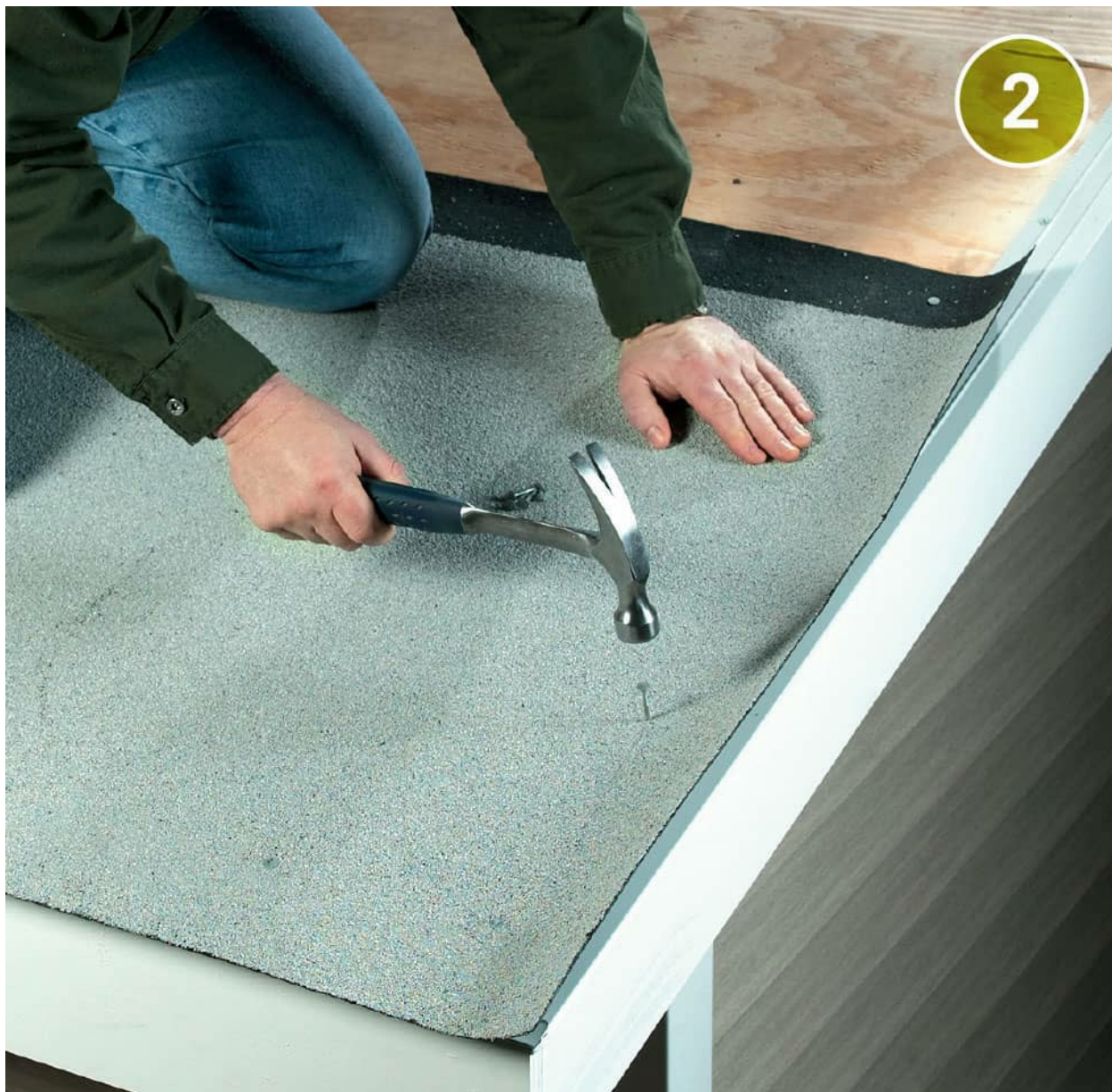


## How to Install Roll Roofing in a Perimeter Bond



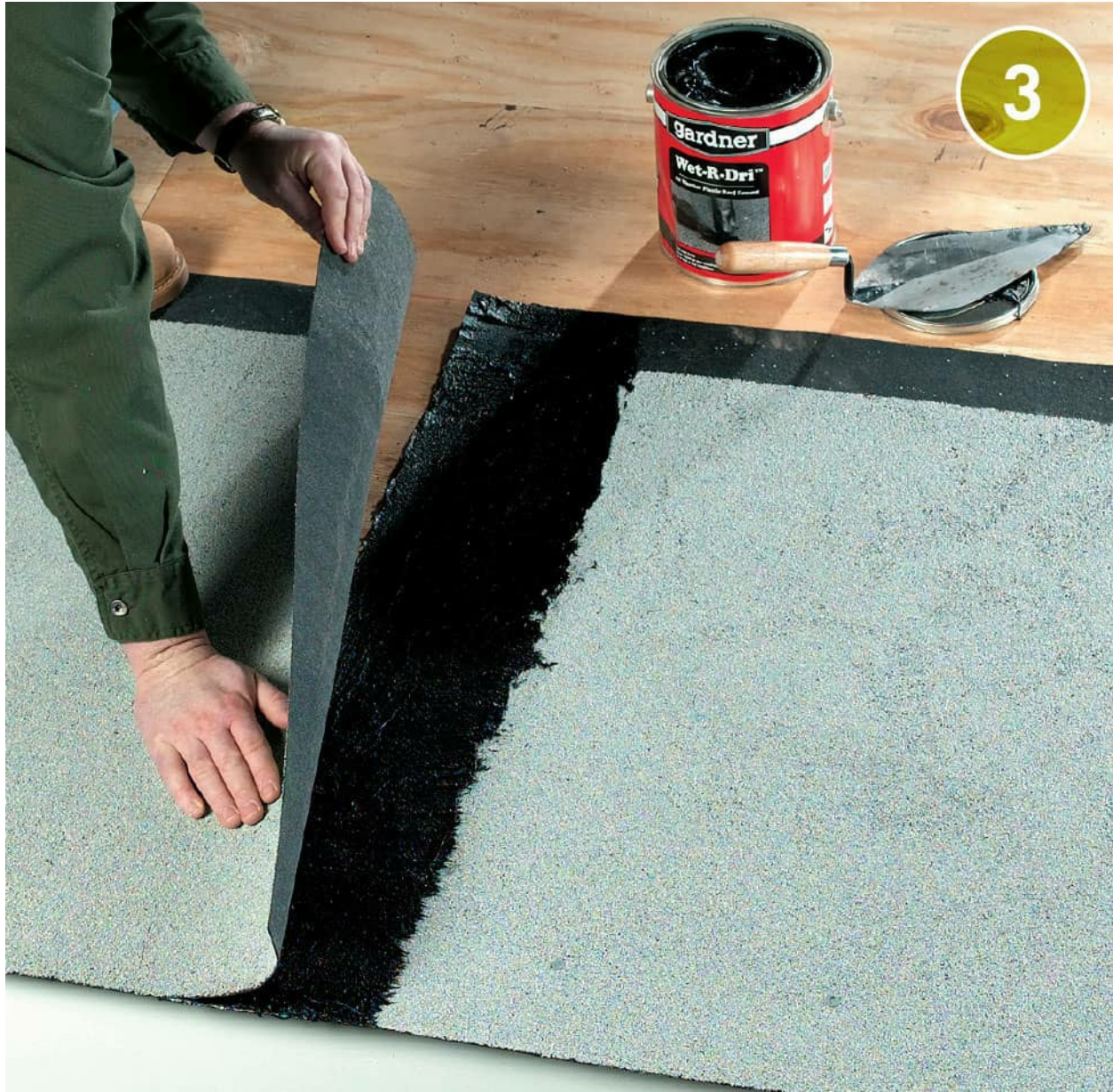
Nail drip edge along the eaves and rake ends of the roof (shown [here](#)). Sweep the roof decking clean. Center an 18"-wide strip of roll roofing over the valley. Nail one side  $\frac{3}{4}$ " from the edge, every 6". Press the roofing firmly into the valley center, then nail the other side. Install a 36" strip over the valley the same way.





Snap a chalkline  $35\frac{1}{2}$ " up from the eaves. Unroll the roofing along the chalkline, overhanging the eaves and rake edges by  $\frac{1}{2}$ ". Nail the roofing every 3" along the sides and bottom,  $\frac{3}{4}$ " from the edge of the decking. Roofing nails should be long enough to penetrate the roof decking by at least  $\frac{3}{4}$ ".



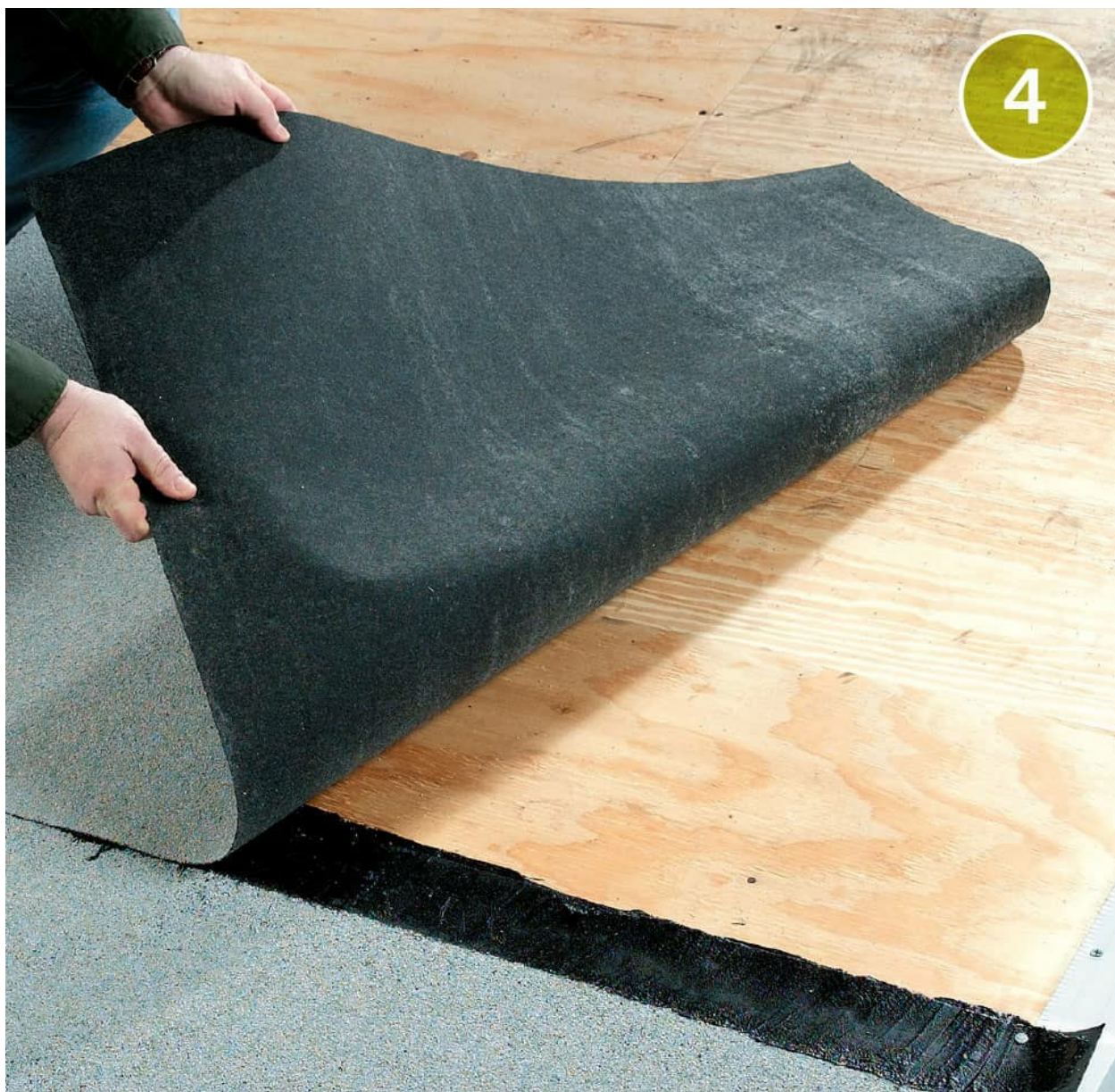


Where more than one roll is needed to complete a course, apply roofing cement along the edge of the installed piece using a trowel. Place a new roll 6" over the first piece. Press the seam together and drive nails every 3" along the end lap.

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**TIP:** Make sure the roofing is straight before nailing. Once it's nailed, you can't adjust it without creating wrinkles and folds. If it's running crooked, cut it and start with a new strip.





**Apply 2" of roofing cement along the top edge of the installed course. Install the second row flush with the line on the roofing, overlapping the cement edge. Drive nails every 3" along the rakes and overlap,  $\frac{3}{4}$ " from the edges. Do the same for remaining rows, offsetting seams at least 18".**





Cut roofing 1" from the valley center using a utility knife and straightedge. Be careful not to cut into the valley roofing. Apply a 6"-wide strip of roofing cement on the valley at the overlap. Place the main roofing over the cement. Do not nail closer than 12 inches from the center of the valley.





**Install roofing in front of a vent pipe.** Cut a square of roofing to fit over the pipe, with a hole in the center. Apply roofing cement around the edges of the square, then set it in place over the pipe. Overlap with the next row of roofing, notching for the pipe as necessary.





Cut the roofing flush with the roof peak. Snap a line on each side of the roof, 5½" from the peak. Apply 2" of cement above each line. Place a 12"-wide strip of roofing over the peak, flush with the chalklines. Drive nails every 3" along the seams, ¾" from the edges.

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**TIP:** Use modest amounts of roofing cement. Excess cement can cause the roofing to blister.

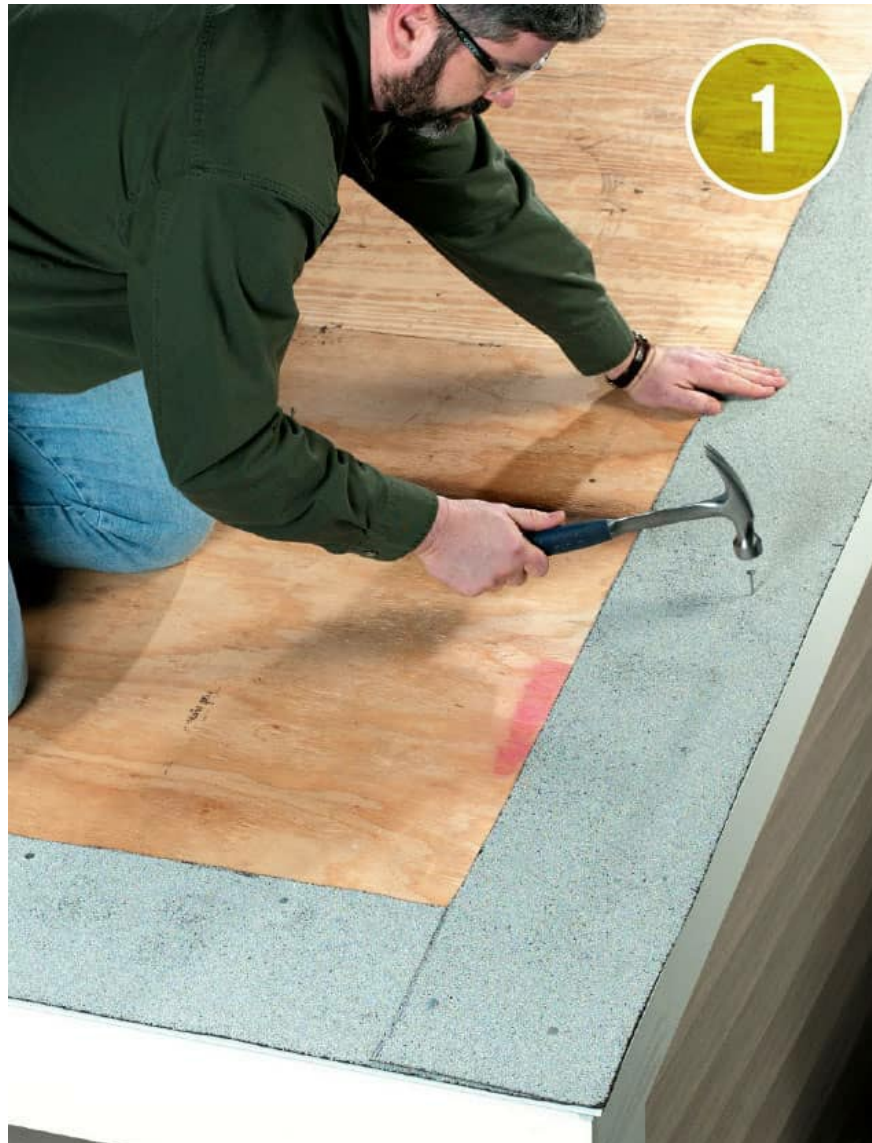




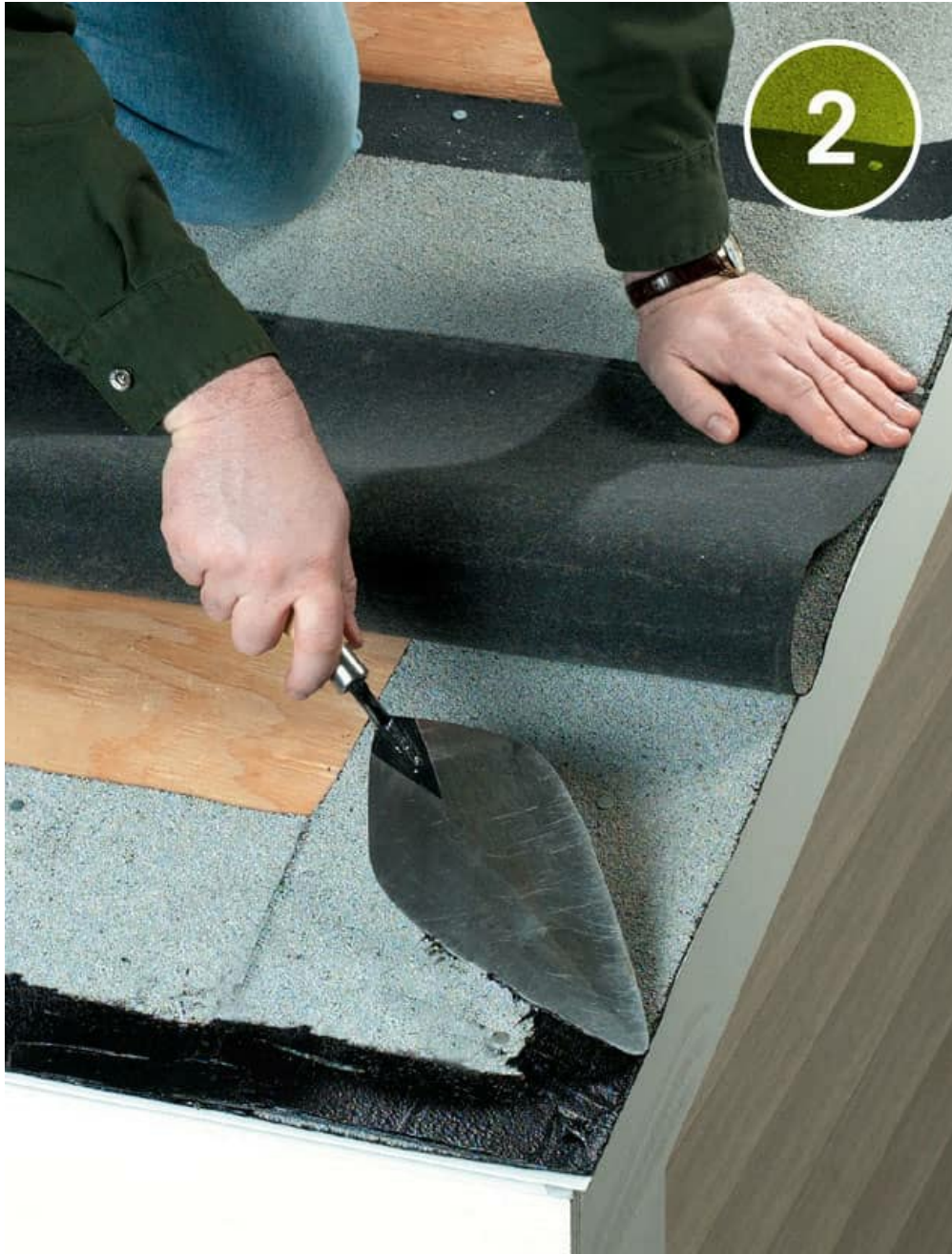
**VARIATION:** Rather than install a strip over the ridge, extend the roofing on one side of the roof 6" past the peak, overlapping the opposite side. Nail along the edge to secure it to the decking. Do the same on the other side, overlapping the installed roofing at the peak. Apply cement along the seam, and nail in place.



## How to Install Roll Roofing (Concealed Nail Application)



**Cut 9"-wide strips of roofing.** Nail them in place along the rakes and eaves. Snap a chalkline 35½" up from the eaves. Place the first course of roofing flush with the line.



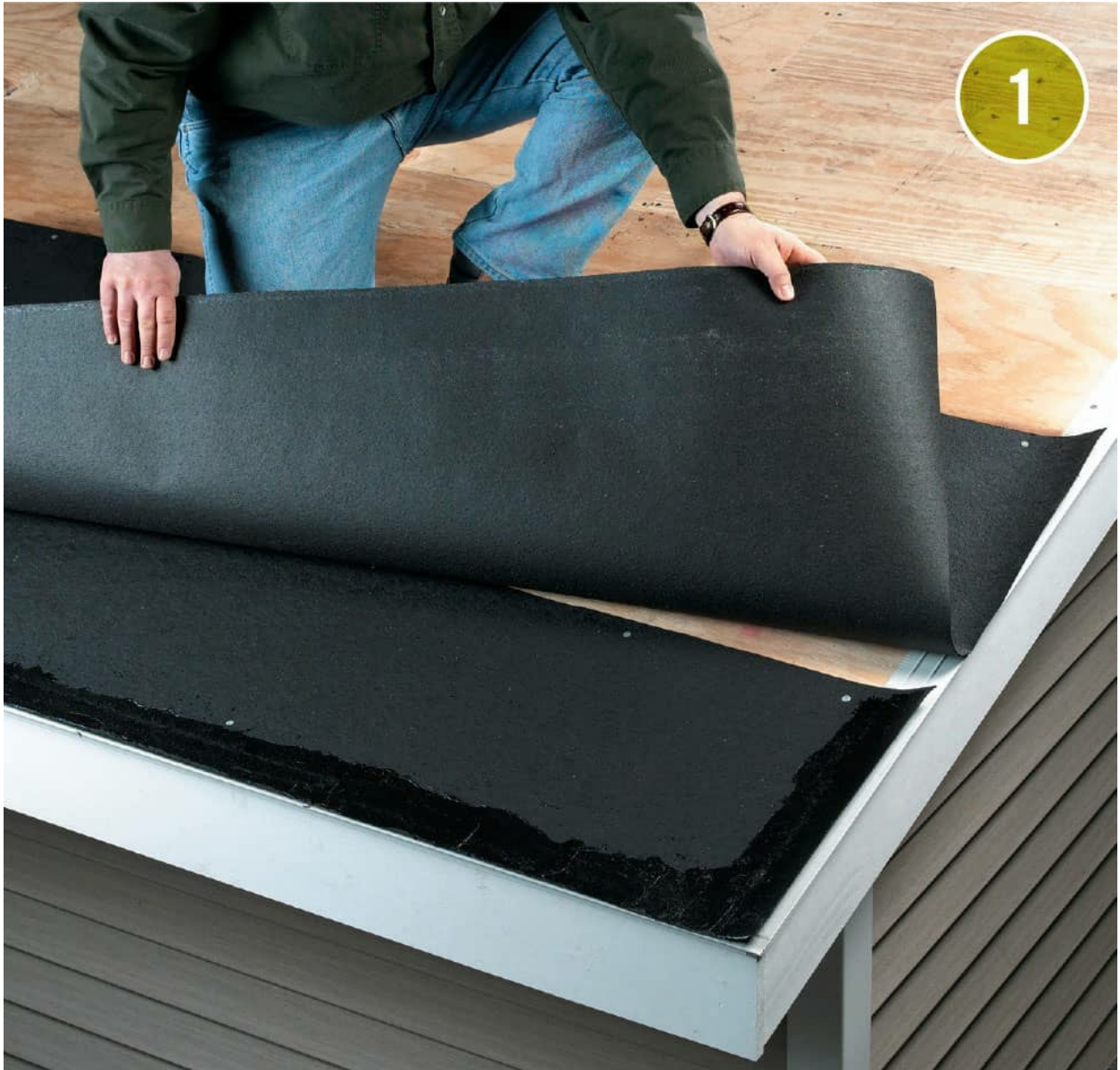
Nail the roofing along the top edge only, driving nails every 4",  $\frac{3}{4}$ " from the top edge. Roll back the side and bottom edges. Apply cement along the outside 2" of the strips installed in step 1. Set the overlapping strip back in place, pressing firmly to seal.





Set the next course in place so it overlaps the first row by 4". Nail along the top edge. Lift the side and bottom edges, apply cement, then press together to seal. Repeat this process for the remainder of the roof.

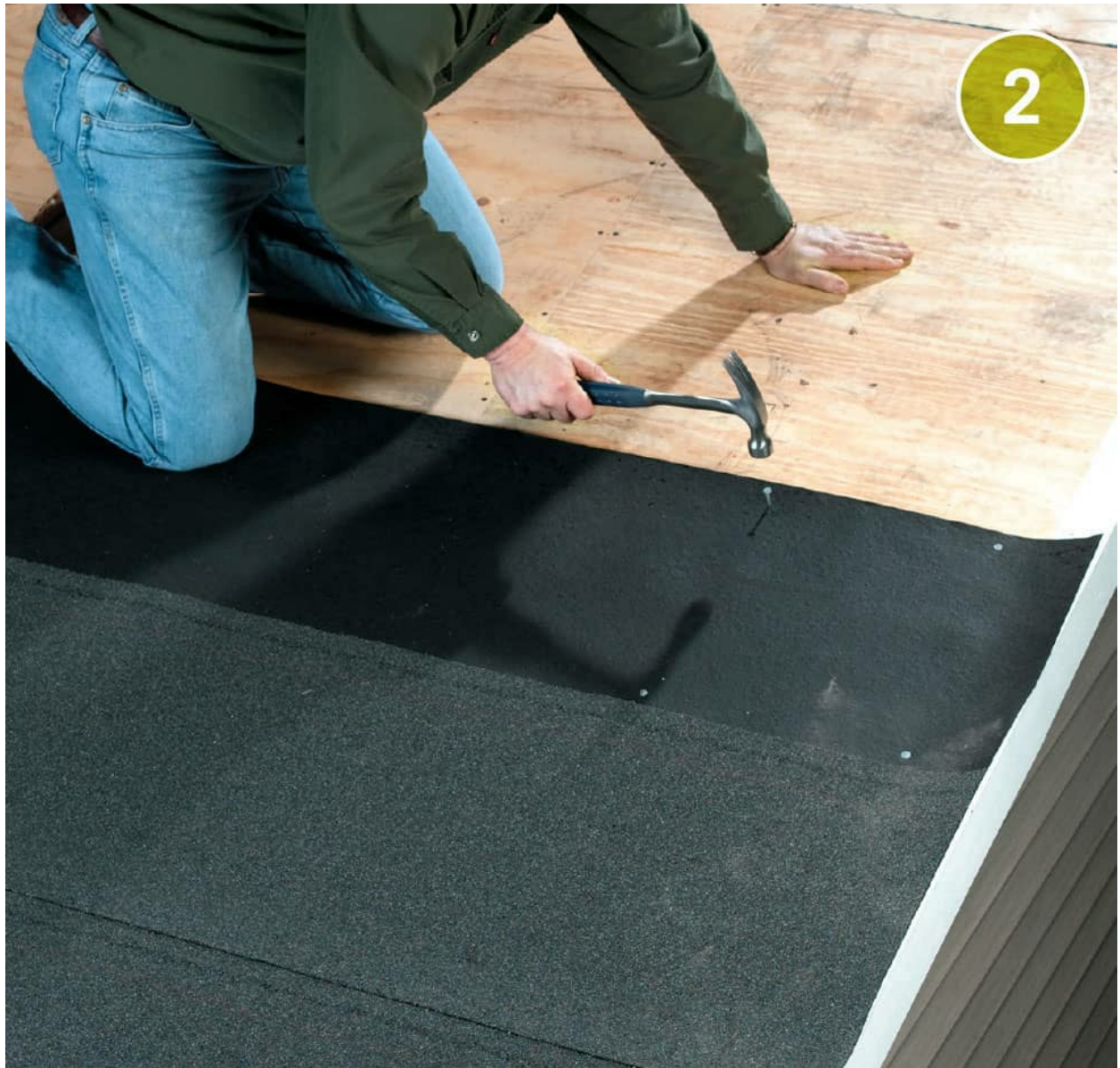
## How to Install Roll Roofing (Double Coverage Application)



Cut away the granular part of the roofing to create a starter strip. Align the strip with the eaves, and drive nails along the top and bottom edge at 12" intervals. Place the first full course flush with the eaves. Nail the nongranule edges every 12". Roll back the bottom of the roofing and apply roofing cement

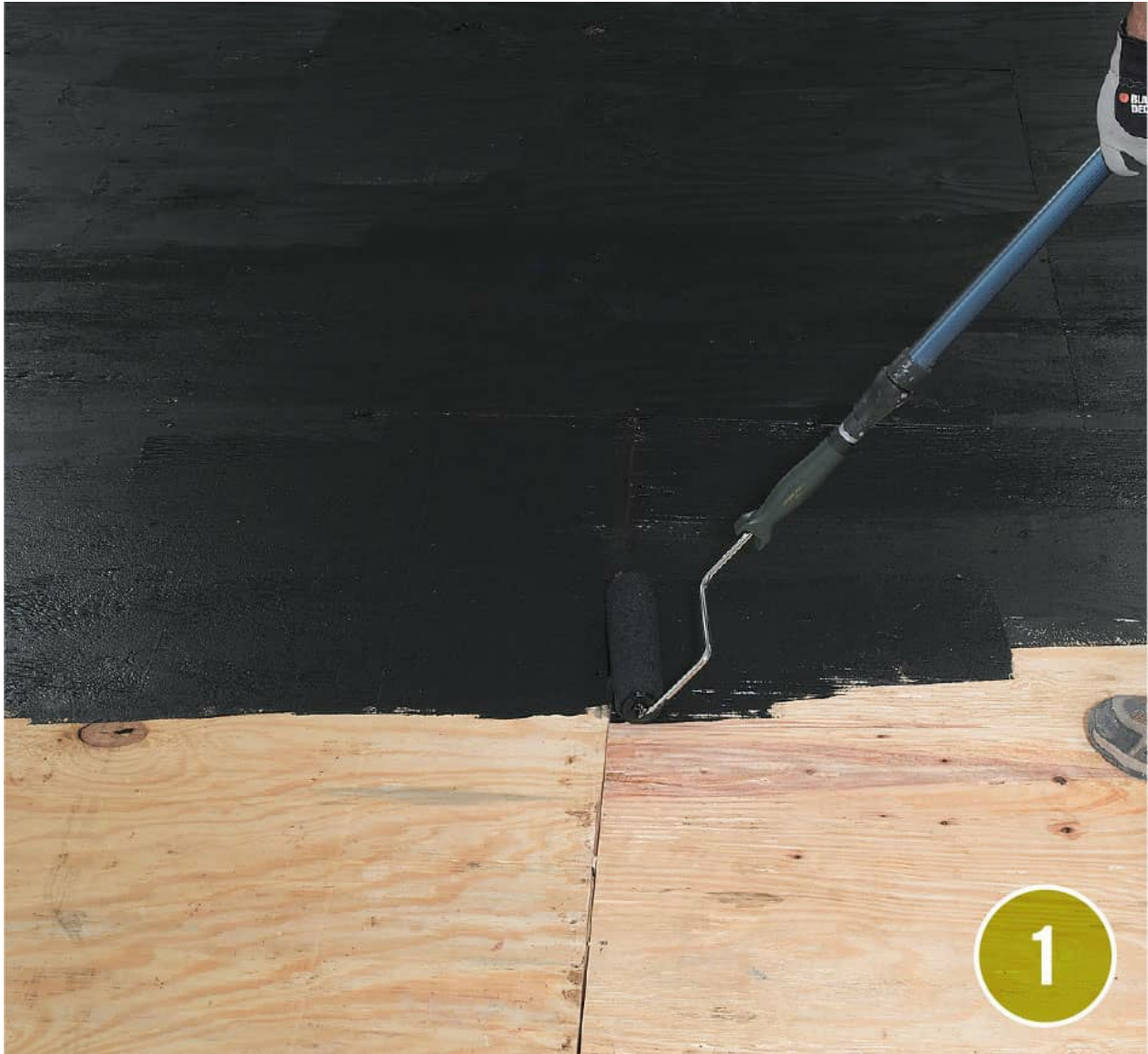


along the eaves and rake edges on the starter strips. Set the roofing back in place, pressing it into the cement.



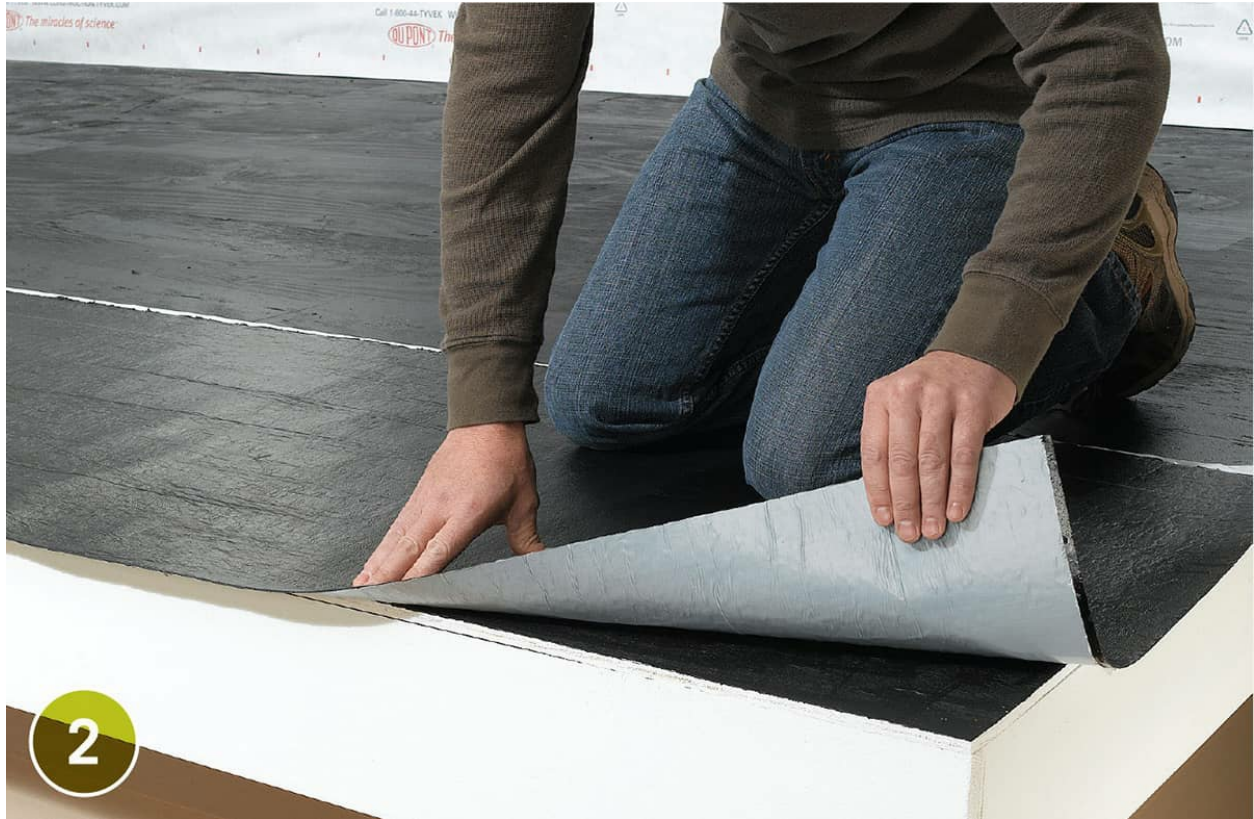
**Align the bottom edge of the second course with the top of the granule edge of the first row. Nail every 12" along the nongranule edges. Flip the bottom part back, apply cement along the sides and bottom of the nongranule area of the first course, then set the strip back in place. Install remaining courses the same way.**

## How to Install Roll Roofing (Self-adhesive Application)



Although not necessarily required in all applications, the best adhesion is achieved when the roof is coated with primer, and some self-adhering roll roofing products require it anyway.





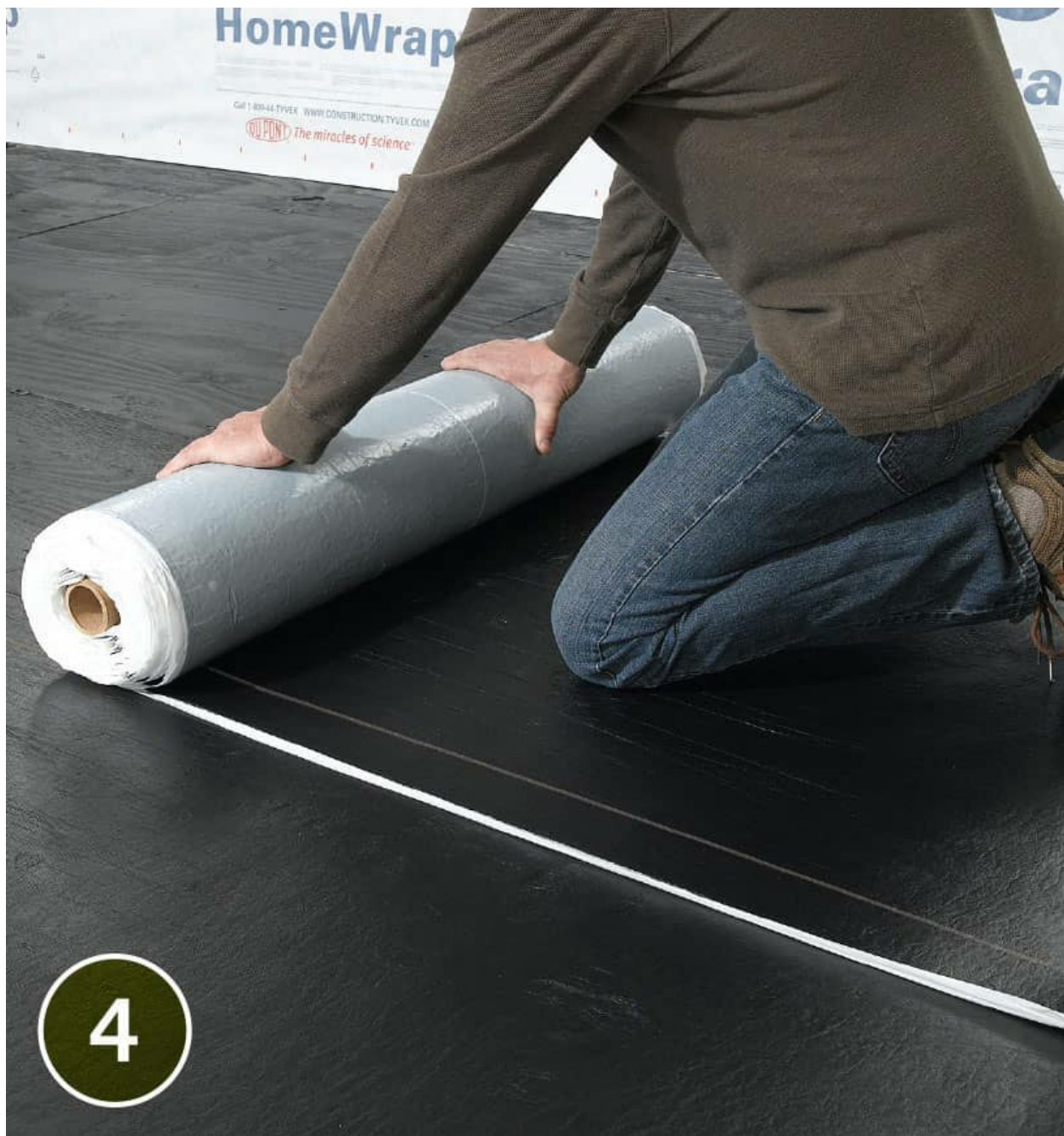
**Cut a piece of base roll in half lengthwise about 19½" (about half of the meter-wide roll) and align it on the base of the roof, allowing about a 2" overhang or whatever is required to turn down and cover the fascia. When the base roll is centered and parallel to the roof, remove the backing and adhere it to the roof from the center of the roll, smoothing out any bubbles or wrinkling as you work toward the outside edges. Smooth the overhang onto the fascia.**



For the next course, position the selvedge edge on the high side of the roof to provide an overlap guideline and to ensure water flows over the side laps. Fold the sheet in half away from the edge of the roof along its length, and remove the backing from the lower half of the sheet. From the center of the length, allow the sheet to roll onto the deck. Use a helper to maintain a straight line and sheet position, and hand-press the sheet to smooth out wrinkles and trapped air. Overlap subsequent sheets in the same course by at least 6", and cut any upper selvedge edges at 45° angles to avoid loose seams and to provide a smooth transition (left). End laps in adjacent courses should be offset by at least 36".

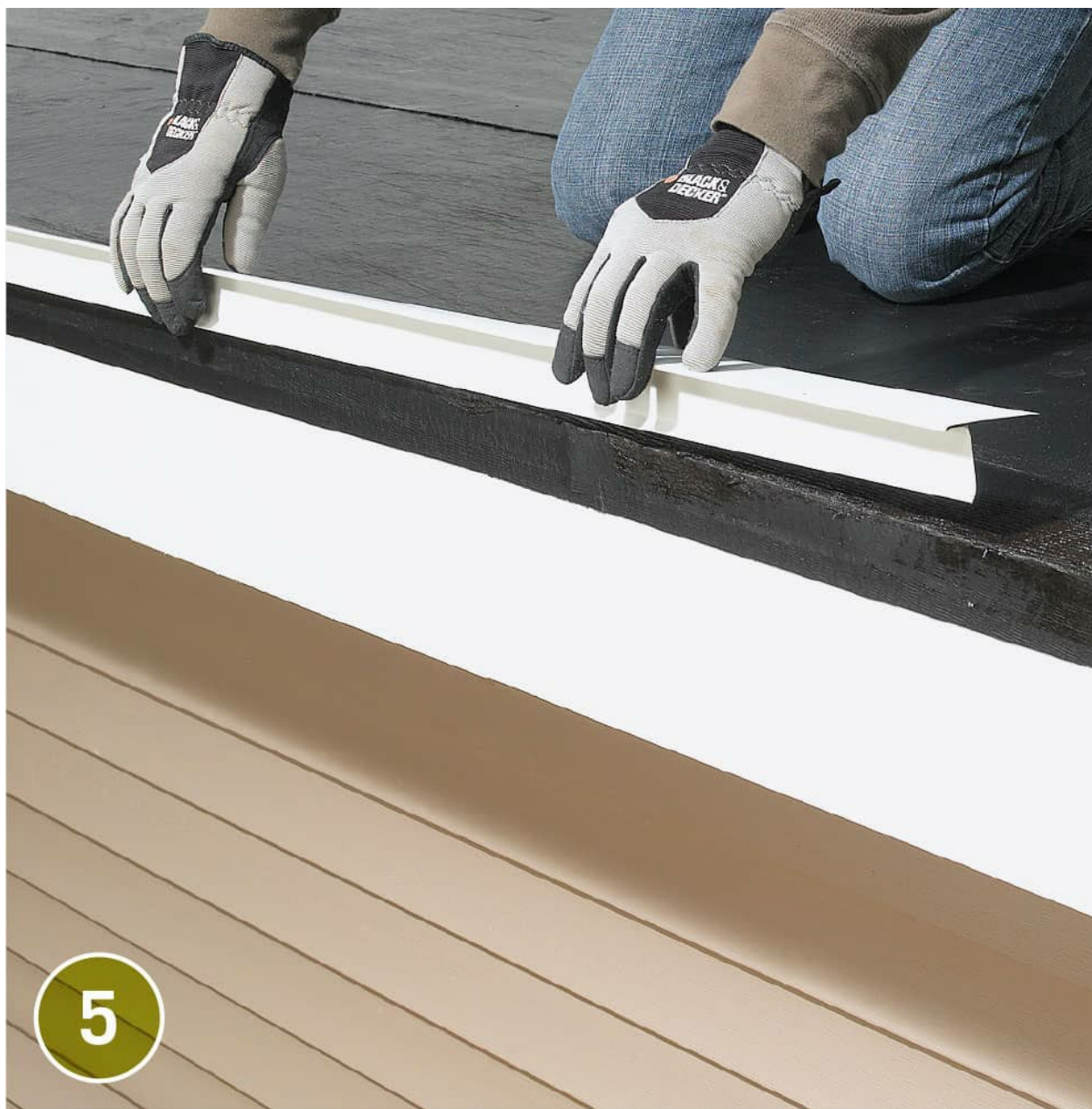






Install subsequent courses by aligning the base ply with the guideline from the previous course. Fold the lower half of the sheet back onto itself once more, remove the backing, and work from the center, allowing the sheet to roll onto the deck. Smooth from the center outward. Repeat the process with the top half of the sheet. When the roof is covered, roll the surface with a weighted roller or push-broom. Use a helper to assist getting the roller or broom to the roof.





To install drip edge, coat the base with a thin layer of roofing cement, and set the drip edge into it. To reinforce the edge to the base ply, install roofing nails 3" on center along a staggered course through the drip edge. Use a notched trowel to apply a 1/8" to 1/16" layer of roofing cement to the top of the metal prior to installing the cap sheet. Also apply a layer of primer and flashing cement where flanged metal termination and penetration flashings are needed, as well as a layer of roofing cement to the top of any metal flanges prior to installing the cap sheets.



To apply the cap sheet, roll it out to manageable lengths, remembering that minimal seams is the goal. Allow the sheets to lie flat for 30 minutes, which lets the ends relax. On the low point of the roof, align the sheet to lie flat and parallel atop the drip edge and eaves. In the same manner as the base sheet, fold the lower half of the sheet away from the edge of the roof, remove the backing, and allow it to roll onto the roof. Repeat with the upper half of the sheet.





**To avoid blistering**, apply a bead of roofing cement adhesive along the top edge of each cap sheet, and at any selvedge edge T-joints. On roofs with slopes greater than 1-in-12, backnail in the selvedge edge area at 18" on center with roof nails or cap nails. When additional lengths of cap sheet are needed in the same course, allow a minimum of 6" of overlap, and end-laps must be offset at least 36".



8

Complete overlapping end joints by applying a 1/8" to 1/16" layer of roofing cement to the granular surface of the underside of the sheet using a notched trowel. Flashing of walls, roof terminations, and obstructions can also be accomplished with these materials. Nail off the flashing at the top and counter-flash backwards. When the roof is completely covered, use a weighted roller to smooth out any wrinkles or bubbling.





## EPDM Rubber Roofing

For roof decks with minimal pitch, even rolled asphalt roofing may not offer enough protection against leaks. In these situations, ethylene propylene diene monomer (EPDM) rubber membrane roofing may be your best—or only—bet. EPDM roofing is easy to install with minimal tools by a do-it-yourselfer. Unlike other membrane systems that must be applied with a torch, EPDM adheres with liquid adhesive. It comes in 10 × 20- or 20 × 100-foot rolls so you can plan your installation to minimize seams.

Installing the membrane involves removing the previous roofing material down to bare roof decking and any flashings around vent pipes or other protrusions. Make sure your roof deck material is clean, dry, and in good repair. You may be able to overlay the deck with a layer of high-density fiberboard or 1-inch isocyanurate insulation board to create a fresh, flat deck surface if the previous surface isn't sufficiently flat or shows signs of minor deterioration. Avoid using insulation products with a waterproofing layer or film. Glue will not penetrate properly into the insulation.

Once the deck is prepared, lay out the membrane sheets so they overlap the edges of the roof and one another by 3 inches. Make any necessary cutouts to allow for roof protrusions and to allow the membrane sheets to lay flat and relax. If your roof abuts a vertical wall, the membrane should extend up the wall 12 inches so it can be adhered to the wall and sealed with a metal termination bar.

Adhering the membrane to the roof deck involves applying liquid bonding adhesive onto the roof deck with the membrane rolled back, allowing it to partially cure, then pressing the membrane into place over the adhesive, and brushing it thoroughly to remove any air pockets. Once the membrane is fixed in place,

you seal the overlapping seams with strips of soft seaming tape and liquid primer, rolling the seams flat. Finish up the roof by trimming the membrane at the roof edges, installing the appropriate boot flashings, and adding any termination bars that may be required.

Follow the EPDM manufacturer's instructions carefully, particularly if they differ from the step-by-step process you see [here](#).



## TOOLS & MATERIALS

- Measuring tape
- Paint roller
- Stiff-bristle push broom
- Utility knife
- J-roller or roller seaming tool
- EPDM membrane
- Liquid adhesive
- Seaming tape
- Primer
- Contact cement
- Termination bars (if applicable)
- Exterior screws

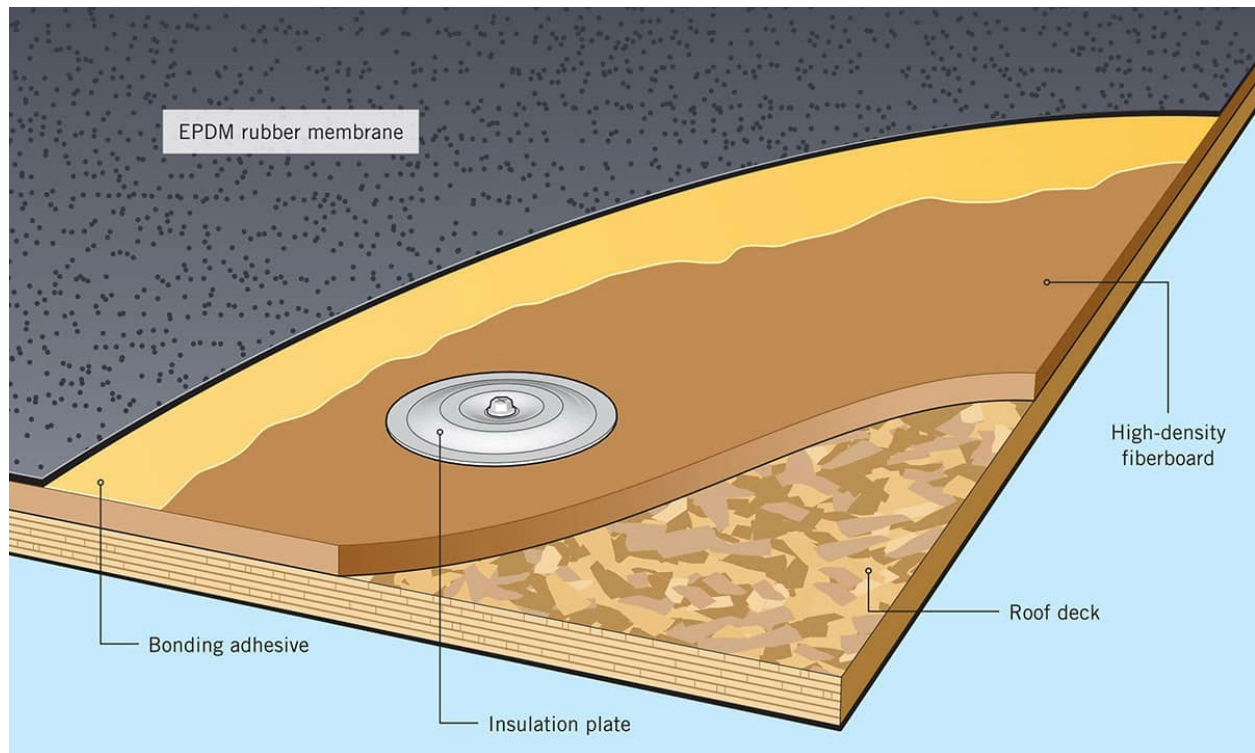




EPDM roofing provides the best protection against leaks on low-pitched roofs. It's an easy-to-install, DIY project. Most home centers now carry rubber roofing in standard 10 × 20' sheets for less than \$150. Some also will sell 10'-wide roofing by the linear foot from a longer roll. When possible, buy a large enough sheet to cover the entire roof. This greatly decreases the likelihood of leaks forming, because it eliminates the need to seam the roof covering.



Rubber roof coverings require special adhesives and primers, as well as flashing and accessories, such as rubber pipe boots. Shown here, from left to right, are pipe boots (A), EPDM adhesive and primer (B, C), hose clamp (D), insulation plates (E), termination bars (F), exterior screws (G), caulk (H), seaming tape (I), EPDM membrane (J), and J-roller (K).



Most rubber roofs are fully bonded to a substrate of insulation board, but they can also be bonded directly to a plywood roof deck or even installed with a perimeter bond only. In some commercial applications they are installed with a layer of river rock on top for ballast.



# How to Install an EPDM Rubber Roof

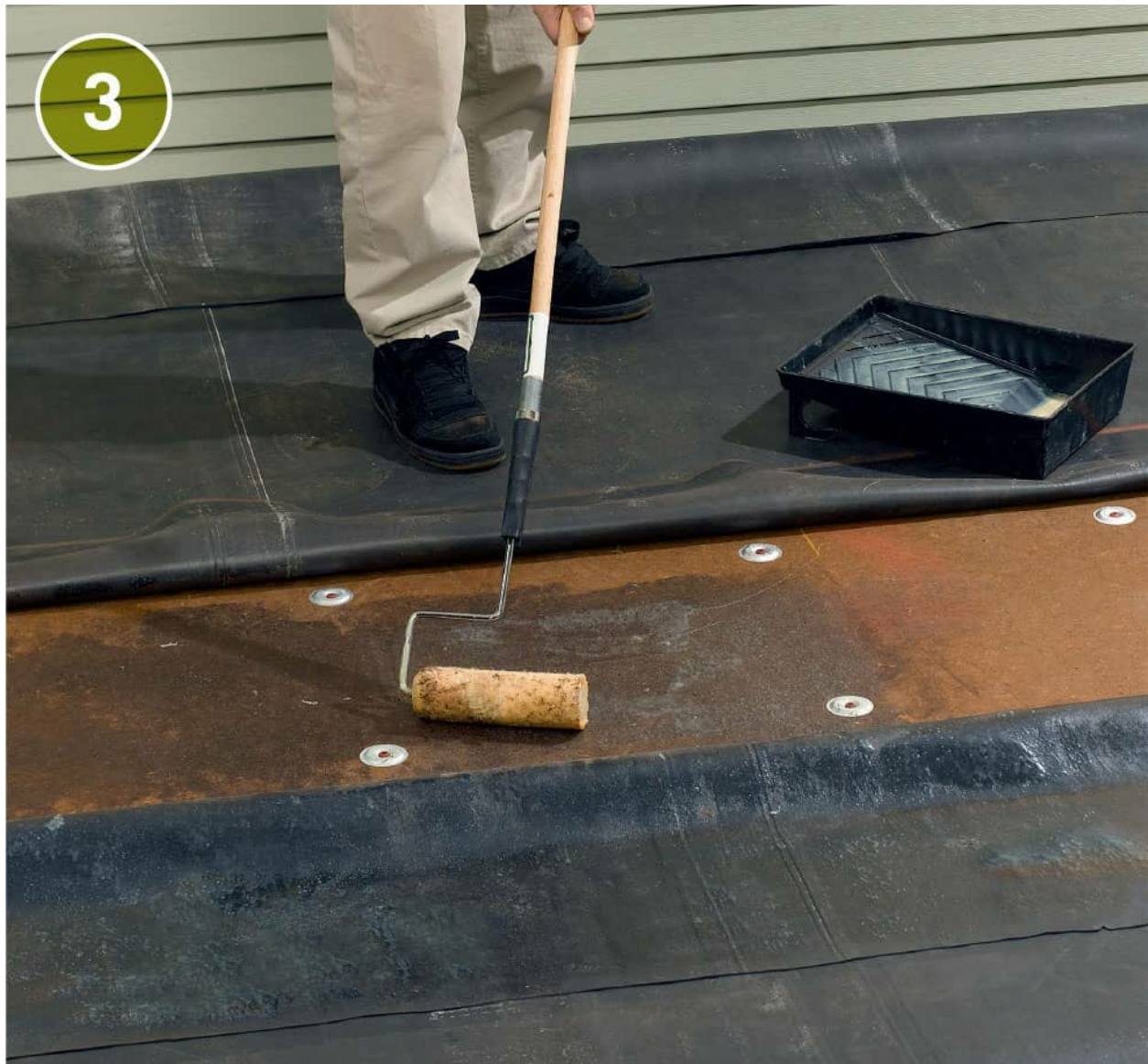


**Prepare the roof deck for membrane roofing** by removing the old roofing material down to bare decking. Look closely for signs of deterioration. Replace deteriorated decking. For a smooth surface, cover the roof with a new layer of high-density fiberboard (sold at roofing materials suppliers). Secure with fasteners recommended by the manufacturer for this purpose—usually long screws with large insulation plates.



Sweep the roof deck thoroughly, and spread out the membrane so it has a chance to relax. Make any cutouts in the membrane that may be necessary to allow for vent pipes or other protrusions. Overlap the sheets by 3" and wipe them down with the recommended cleaner to prepare the surfaces for adhesive.



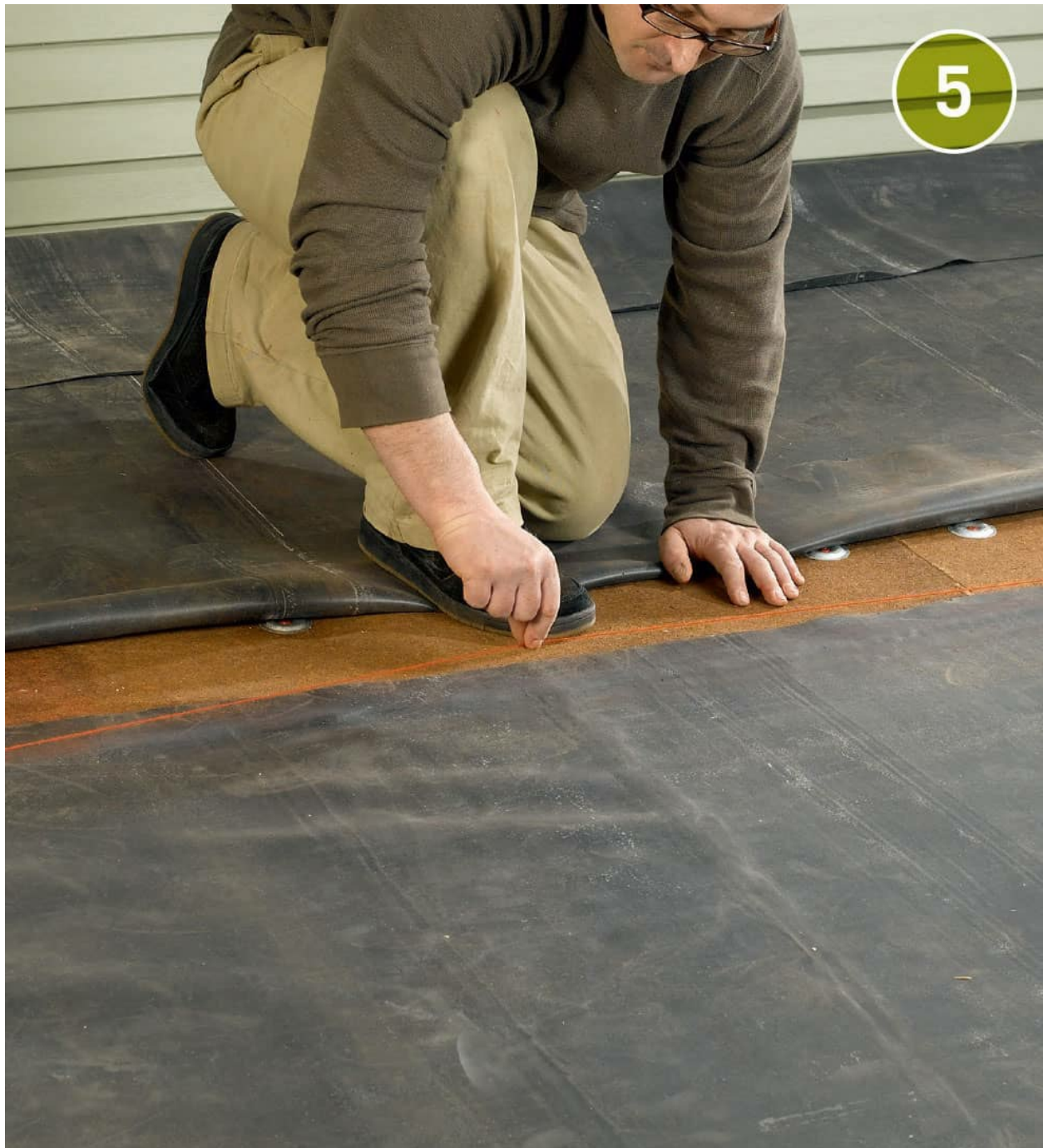


**Apply the latex adhesive.** Fold half of the first membrane sheet over on itself to expose the roof deck, and roll a heavy coat of adhesive onto both the deck and membrane surfaces with a medium-nap paint roller. However, do not apply adhesive to the overlapped section of membrane. Once the adhesive begins to set (about 20 minutes in normal conditions), carefully roll the folded rubber down into place. Avoid wrinkling the membrane.



Use a stiff-bristle push broom to brush out any air pockets that may be evident under the bonded half of the membrane. Brush from the middle of the roof outward to the edges. Then fold the other unbonded half over, apply adhesive to the rubber and roof deck again, and adhere this half of the membrane to the roof. Apply all sections of membrane to the roof deck in this fashion, but do not apply adhesive within 3" of the edges of any overlapping sections of rubber; these must be accessible for applying seaming tape along the seams.





Roll the top section of overlapping membrane back along the seam area, and chalk a reference line 3" from the edge of the bottom membrane. This marks the area for applying seaming tape.



**Tape the seams.** Use the recommended cleaning solvent to clean both halves of the overlapping membrane in the tape areas, then apply seaming tape sticky side down to the bottom membrane within the marked area. Press the tape down firmly to ensure good adhesion to the membrane.

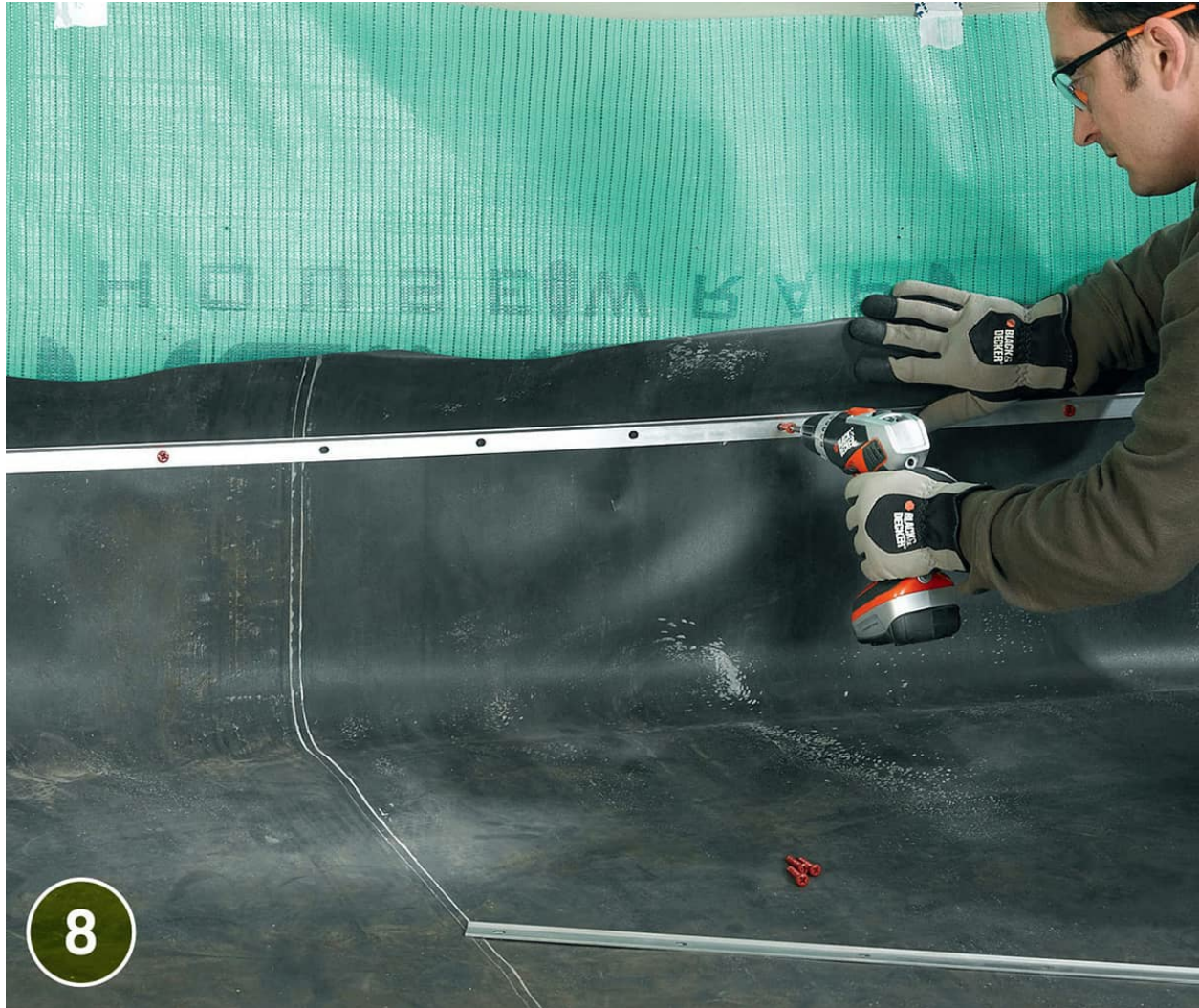




Fold the top membrane overlap back in place on the tape. Slowly pull off the tape's paper backing with the membrane edges now overlapping. Press the overlapping edges down to create a tighter, smooth seam. Roll the seamed areas with a J-roller or seam rolling tool to bond the seam (left).







If the roof meets a vertical wall, you may need to remove siding so you can bond the membrane to wall sheathing. Use contact adhesive to apply the membrane 12" up the wall. Seal the edge with a metal termination bar fastened to the wall with exterior screws. Trim off overhanging membrane around the roof edges, and flash it according to the manufacturer's recommendations using rubber adhesive flashing and rubber boots.



## Raised Seam Metal Roofing

**R**aised seam metal roofing is an attractive, long-lasting material that installs quickly and suits even the roughest climates. In addition to the standing seam metal roofing shown in the following steps, metal shingle and metal tile roofing materials are also available, and manufacturers offer a wide variety of colors for all three options.

Metal roofs are designed for fail-safe installation, as long as you follow the manufacturer's instructions and use the proper components. In fact, you are less likely to make a mistake installing metal roofing than you are with asphalt shingles, especially with valley and flashing installation. Some metal-working skills may be called for, but they are simple to learn.

If local codes permit and your old roof is smooth and in good condition, you can cover it with metal roofing without a tearoff. However, you must first check for structural damage, remove all moss and debris, remove protruding nails, and nail down loose or cupped roofing. In addition, remove all ridges, hips, and flashing, and cut back the roofing at eaves and rakes until it is flush with fascia.

New types of standing seam roofing have snaplock panels that suit slopes as low as 3-in-12. Others, whose seams are fastened on site using a simple tool, handle pitches as low as ½-in-12.





## TOOLS & MATERIALS

Cordless drill/driver with hex and Phillips bits

Snips, left-hand

Snips, right-hand

Snips, aviation type

Nibbler

Chalkline

Caulk gun

Pop riveter

Broad pliers (hand seamers)

Turn-up tool

Markers

Scratch awl

Utility knife

Mastic tape

Tape measure

Duckbill pliers

Hammer

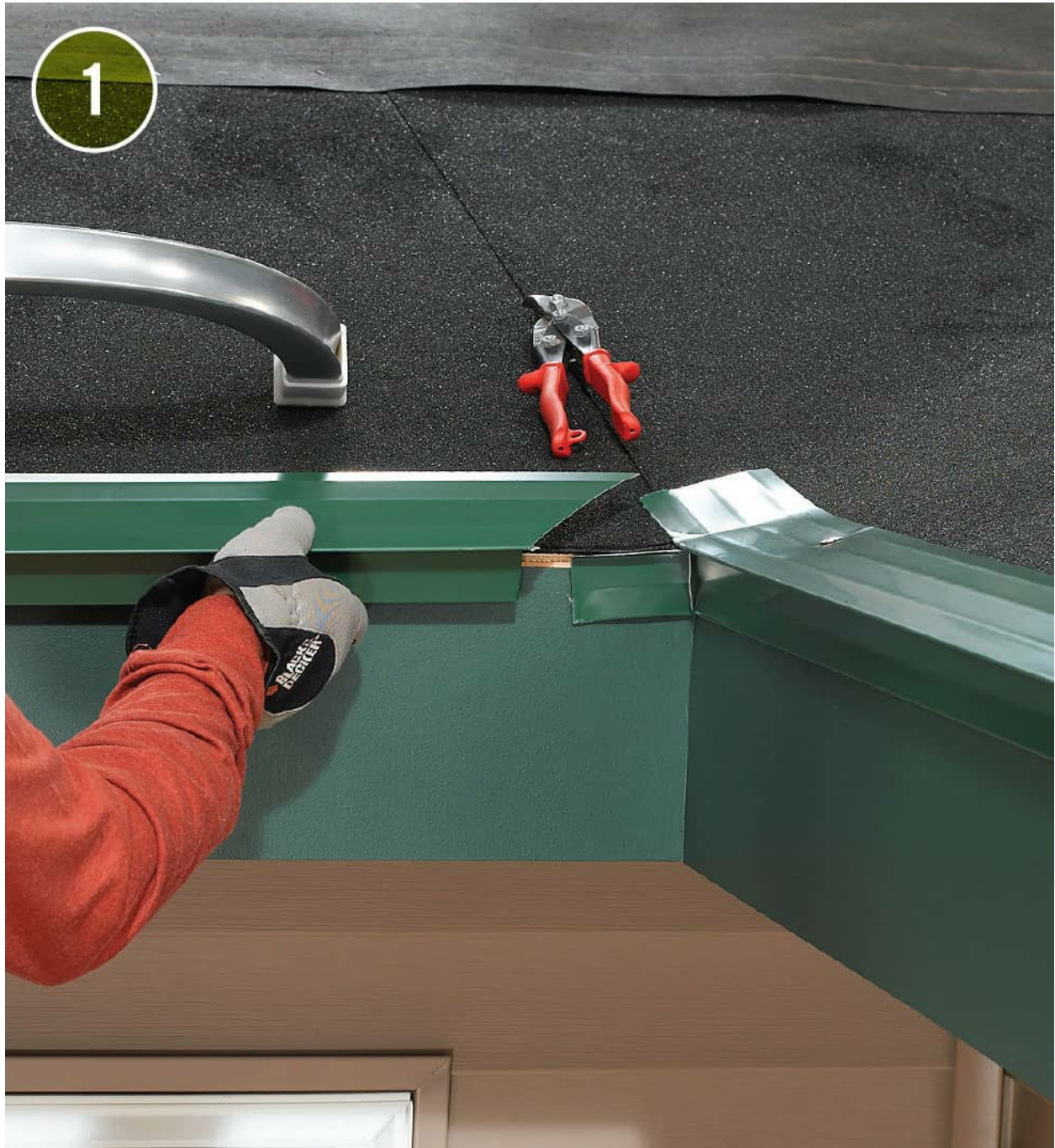
Roofing nails

Eye protection

Gloves



## How to Install Raised Seam Metal Roofing



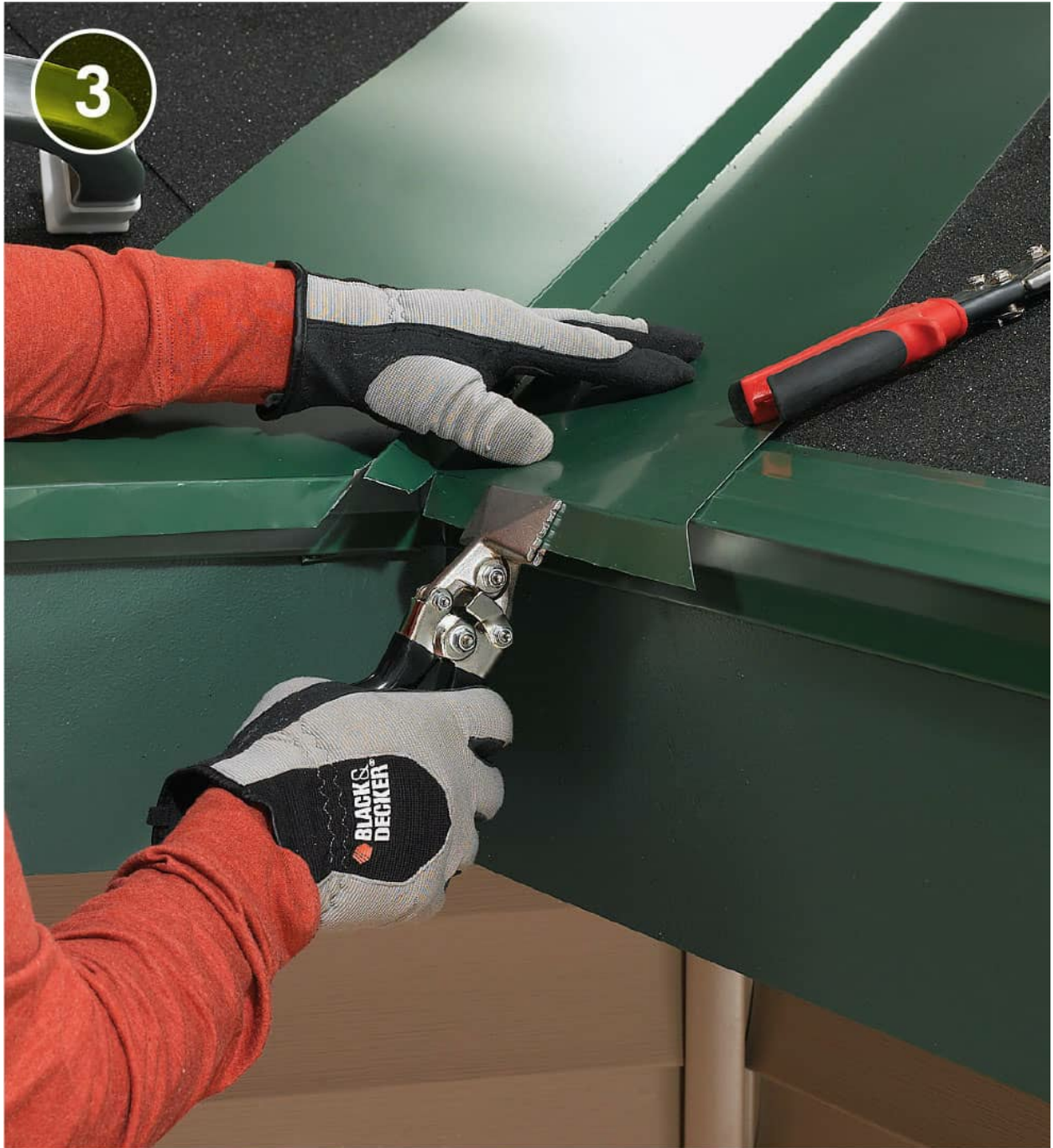
Cut and fasten drip edge after you have installed the ice and water shield and felt for the roof. Follow manufacturer's specs for the location of the fasteners,

typically a few inches up from the edge of the eave. At a valley, cut the drip edge so it overlaps the adjacent piece.



Overlap drip edge at the gable so when the rake flashing is installed it also overlaps. To do this, cut away the lip of the flashing and score the bend line with an awl. Use duckbill pliers to grip the flashing at the score line and bend to make an overlapping tab. Use a pop riveter to secure the overlap.





Prepare the valley flashing by laying it on the valley and using a straight edge to mark a cut line along the eaves. Cut the flashing to create tabs that, once scored and bent, overlap the eaves flashing.



Position the valley flashing and push down so it is fully seated in the valley. Check that its end extends past the eaves by 1". Along the edge of each side, tack or screw it in place every 6".





**Apply two rows of butyl mastic tape to each side of the valley ridge, spacing them according to the manufacturer's recommendations. Typically, the roofing panels overlap the flashing within a minimum of 4" of the ridge that runs down the middle of the valley flashing.**



**Use a helper to install the panels.** The panels are durable once installed, but can be bent and scratched during handling. While the panels are waiting to be installed, weight them down or secure them on the ground to keep them from blowing away.





Not all roofs are square, so use a panel and tape measure to mark an alignment line  $\frac{1}{4}$ " from the eave. Use the "3-4-5 method" to check for square: Mark a point 3' up from the eaves and another point 4' from the panel. When the panel is squared up to the eaves, the distance between the two points is exactly 5'.



Use a cordless drill driver with a socket to attach panels. Set the panel so it overhangs the eaves as recommended. Follow instructions for spacing the fasteners—every 12" on center is typical. Fasteners have flexible washers that must be snugged down firmly, but not too much.





**Snap in the second panel.** Metal panels install quickly, neatly locking in place with firm downward pressure. Begin locking the panel in place at the eaves and work upward. Never lock from both ends toward the center—you may create a bulge.



Cut openings for vent stacks and other obstacles with a metal snips or a nibbler. To mark the panel, set it beside the stack, check that it extends over the eaves by 1", and use a square to mark the upper and lower edges of the stack, adding 1/2" for wiggle room. Then measure from the nearest fastened panel so you can mark for the width of the stack.





Trim the vent stack boot so it fits snug over the stack. Neoprene boots are made with ridges that guide your cut. Dry fit the boot, adjust as needed, then refit it and caulk around the stack.



Caulk and fasten the base of the stack boot, positioning fasteners every 1–2". Double check that the caulk and boot seal along ridges in the panel.



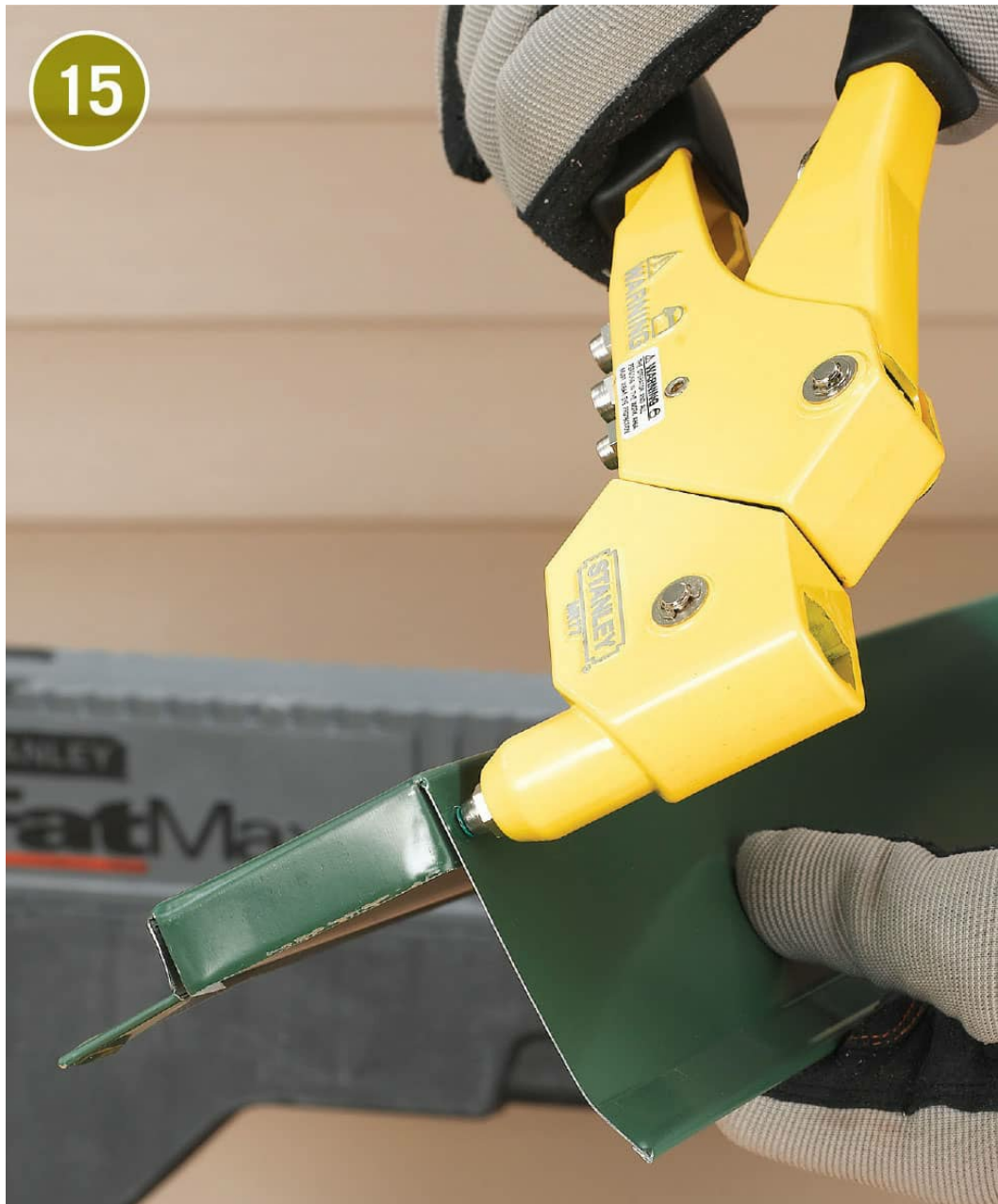


Cut panels lengthwise by using left- and right-hand snips in tandem. If you use a circular saw with a metal-cutting blade, add masking tape to the underside of the saw shoe to preventing scratching. Wear ear and eye protection.



Use a guide to mark panels at the valley. First, rough cut and position panels so they overhang the eaves properly. Then use a scrap of wood at least 4" wide as a marking guide. Cut the panel.





Close off the end of your rake flashing. Before cutting the flashing to length, cut tabs as shown and bend them so they overlap. Use pop rivets to fasten the tabs together. Trim the completed closure as needed.

16

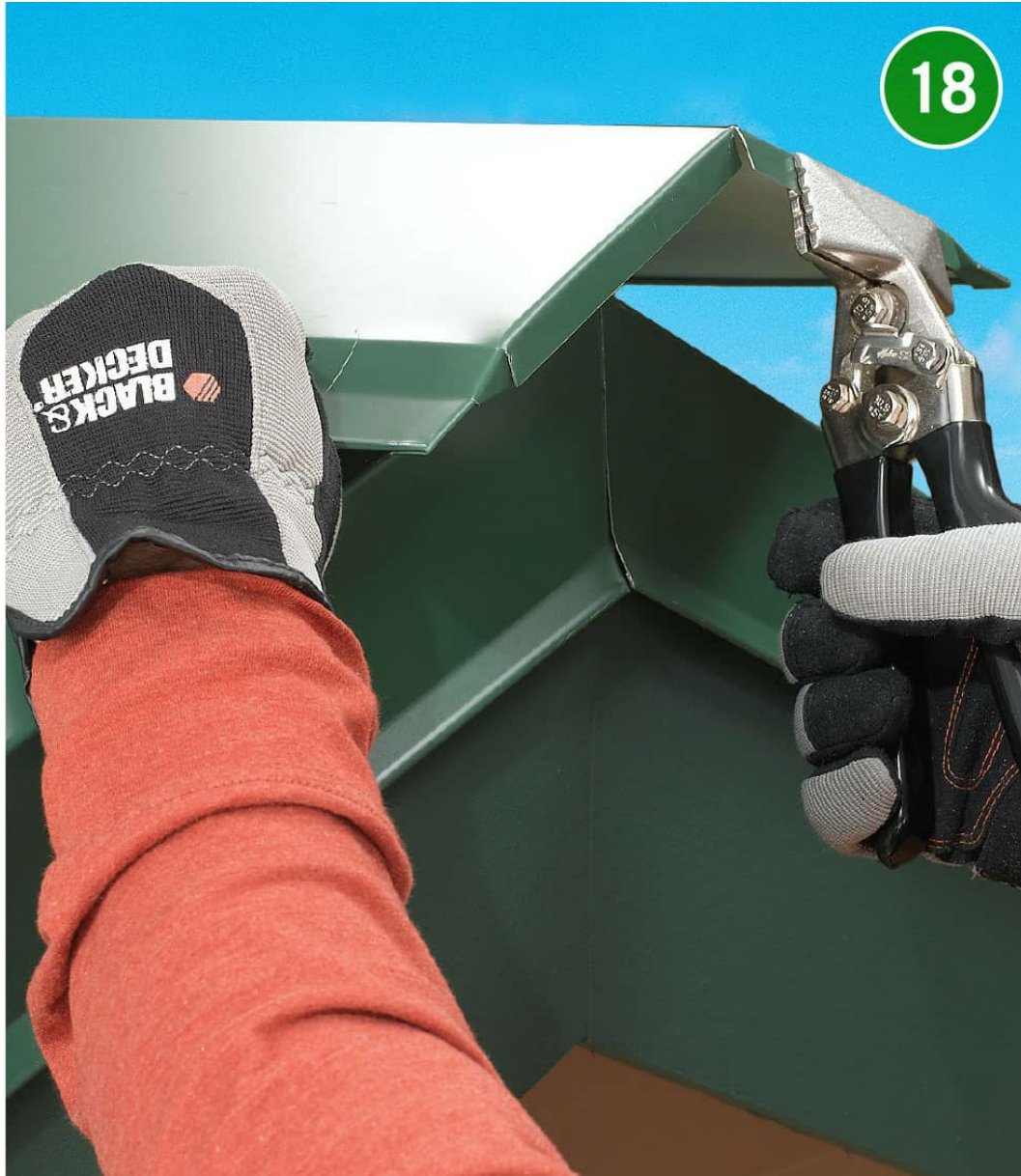


Fasten the rake flashing using the fastener and spacing recommended by the manufacturer—typically gasketed fasteners 24" on center. Apply butyl mastic tape before positioning and fastening.



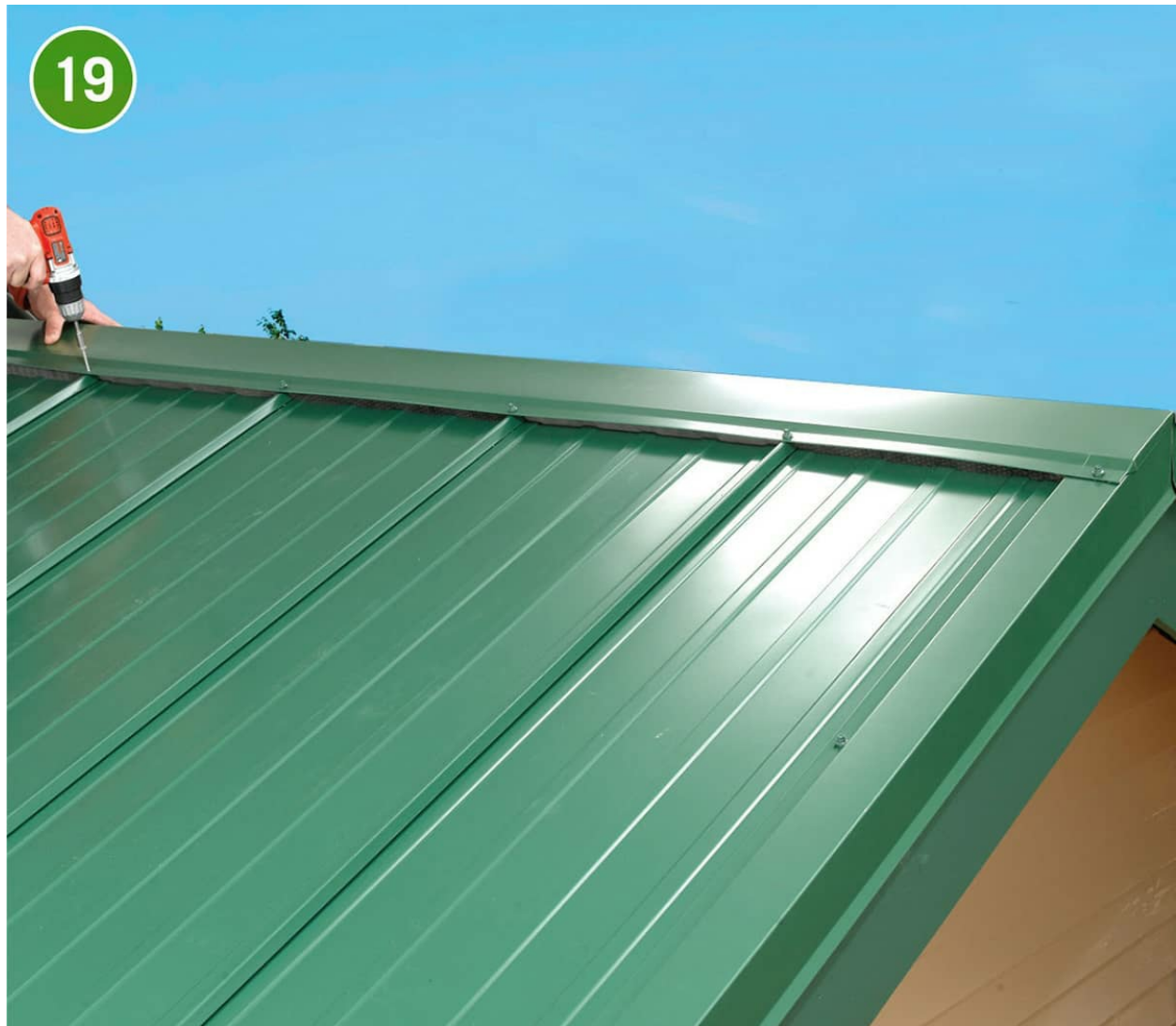


Install side wall flashing after cutting tabs and bending them to close off the end. Install any end wall flashing as well. In both cases, you may first need to remove a course or two of siding in order to secure the flashing to the wall.



Install perforated zee closure top caps to the ridge to permit ventilation while preventing weather and pests from getting in. Check manufacturer's specs for positioning and caulking before fastening.





Close off the end of the ridge piece by cutting and bending tabs. Caulk the overlap before pop riveting the closures. Install the piece with fasteners driven into the standing seams.



## Faux Slate

No roofing materials are fun to work with, but faux (also called artificial or simulated) slate comes close. It is easy on the hands, cuts with a utility knife (though a power saw is faster), and nails easily. The shingles feel reassuringly hefty and firm, a material you can well imagine living up to its 50- to 75-year warranty. It does not soften in hot weather, easing summertime installation—a serious problem with asphalt shingles. Unlike the real thing, faux slate is an ideal do-it-yourself material as long as you abide by the manufacturer's installation instructions.

Although it is roughly twice as expensive as asphalt shingles, faux slate's good looks and longevity make it an increasingly popular choice, especially for owners of vintage homes. Some manufacturers tout the use of recycled materials; others emphasize "virgin" content unsullied by variable quality of recycled raw materials. Some faux slate shingles feel stiff and very plastic-like, while others are noticeably more flexible like rubber. Whatever the material, faux slate looks very much like the real thing.





Faux slate looks just like the real thing but is easy to install and substantially less costly than slate. Made of polymer or recycled tires, the shingles are molded to mimic the rough edges and deep shadowlines of natural slate.



## TOOLS & MATERIALS

Tile bundle(s)  
Chalkline  
Extension ladder  
Flashing  
30# building paper  
Drip cap  
Ice and water shield  
Pneumatic nailer  
Galvanized roofing nails  
Utility knife  
Straightedge  
Circular saw  
Carbide saw blade  
Sawhorse or workbench  
Clamps  
Fall-arresting gear  
Eye protection  
Gloves



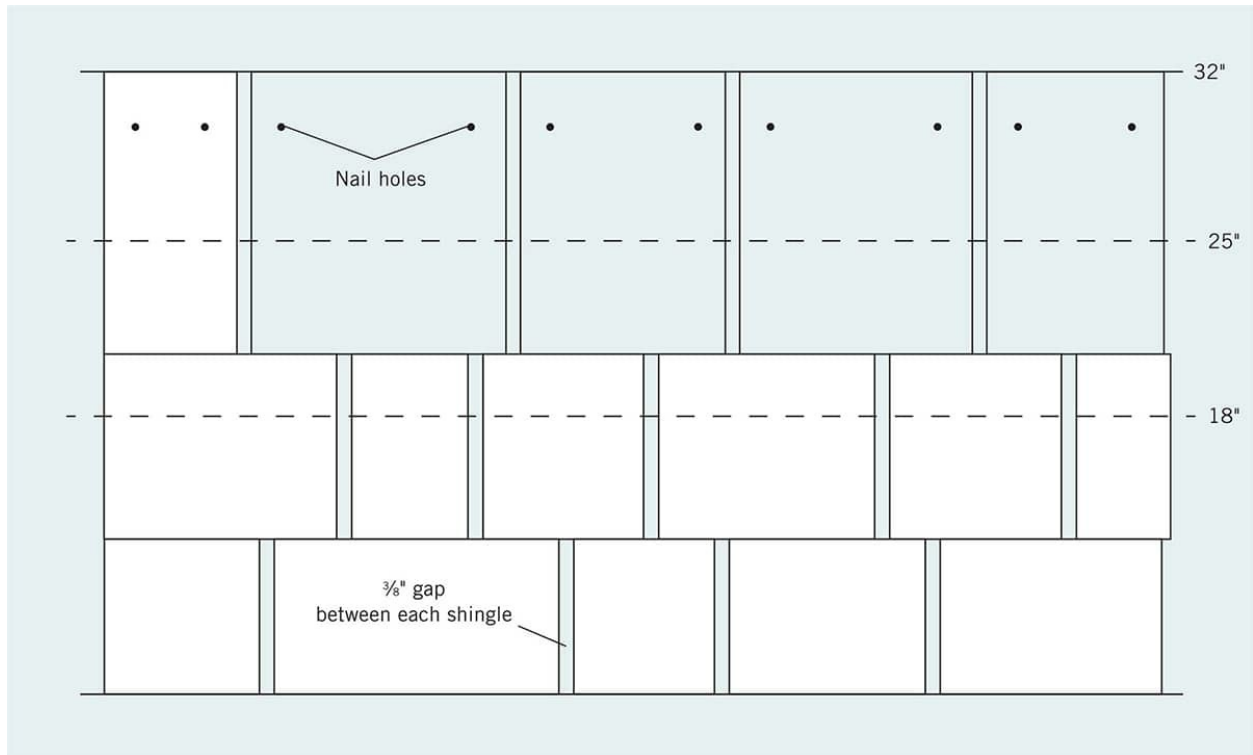


## MIX AND MATCH TO SUIT YOUR ROOF

Not all roofs are created equal, nor will they match exactly the amount of tiles ordered. DaVinci, as we've used here, and other brands often are available in premixed and blended bundles of several different sizes. An installation where cuts don't need to be made along rakes or gable ends creates a more authentic-looking roof. When your measurement comes within 18 to 24" from a rake, you can get an exact measurement and install a combination of tiles that will fit without cutting. You'll reduce your waste by an incredible amount and also allow the realistic look of the faux slate to remain intact.

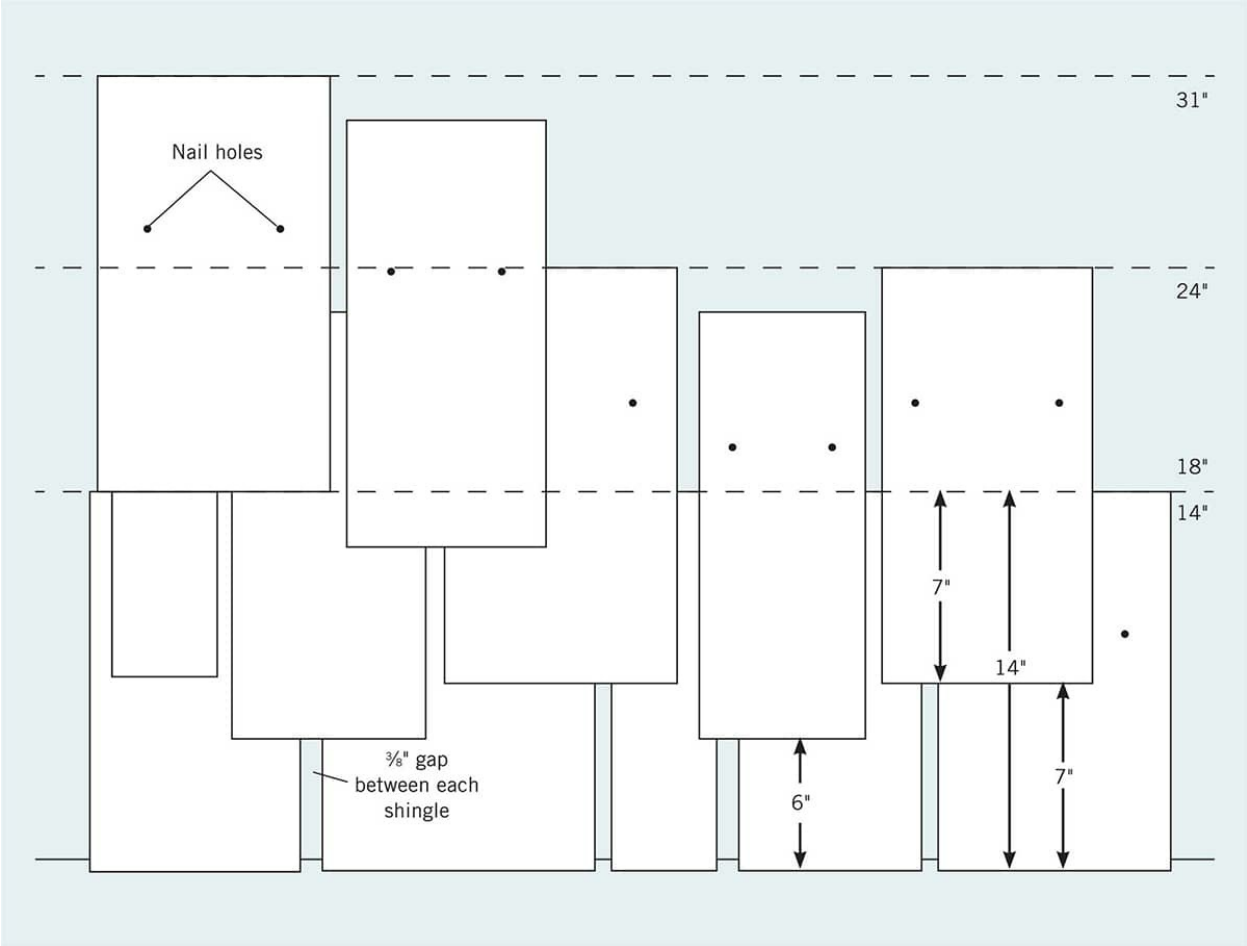


Faux tiles are available in premixed shapes and sizes to accommodate most roofs and reduce waste.



Faux slate shingles can be installed in straight coursing fashion (top) or with staggered coursing (bottom).





# How to Install Faux Slate Roofing

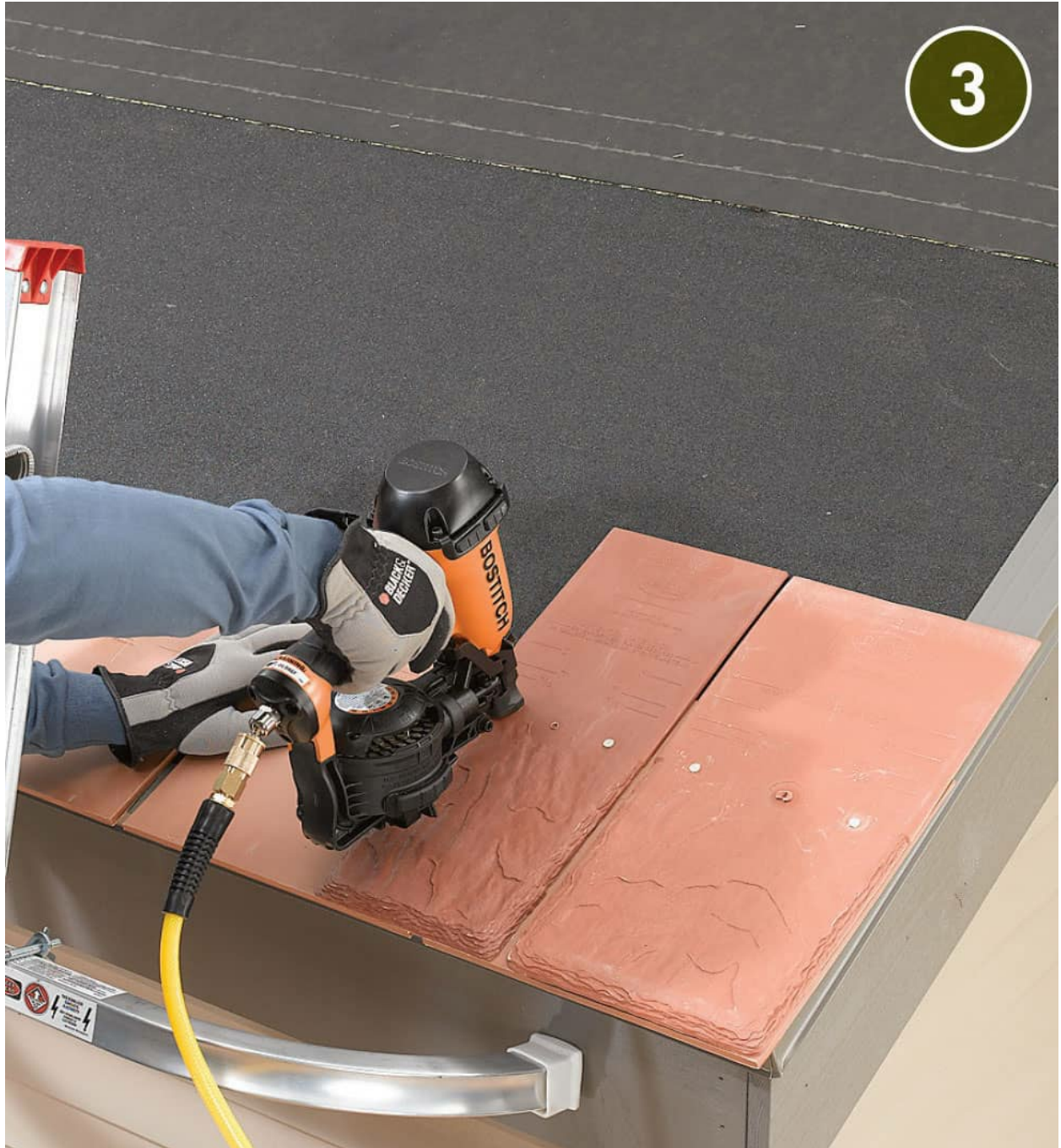


Prepare the roof by installing ice and water shield along the eaves and valleys. Cover the rest of the roof with 30# building paper and install drip cap. With a chalkline, strike a mark so your starter shingles will overhang the drip cap by 1".



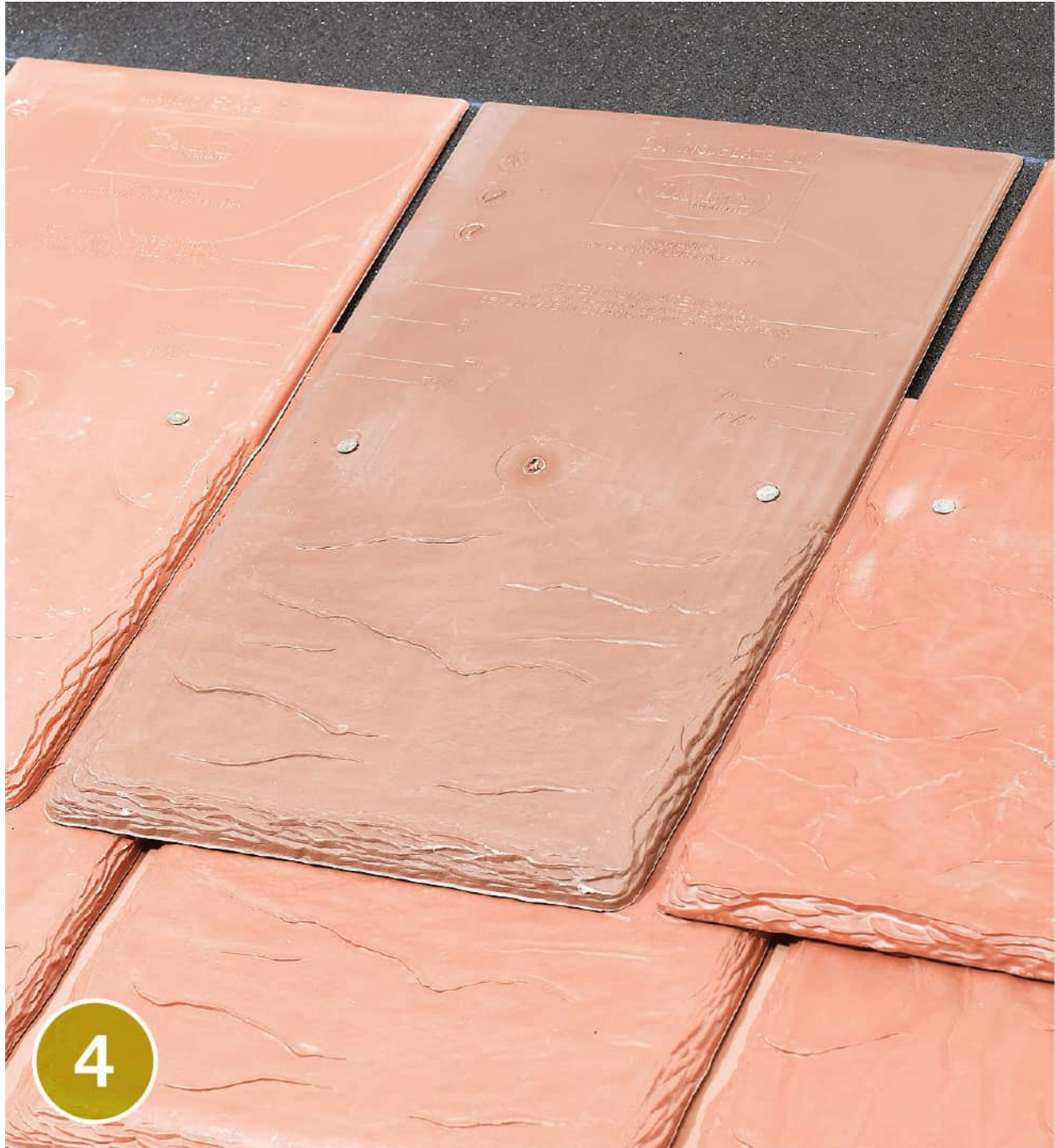


**Install the 12"-wide starter shingles, overhanging the eaves drip cap by 1". Nail the shingles where indicated, typically 6" up from the bottom and  $\frac{3}{4}$ " in from each edge. Use stainless steel, copper, or hot-dipped zinc  $1\frac{1}{2}$ " roofing nails. Do not staple. Space shingles  $\frac{3}{8}$ " apart using a scrap of wood as a guide.**



Begin the first course with any shingle except a 12"-wide shingle. This ensures that the gap between the starter shingles is overlapped 1½" or more. Nail the shingles where indicated on the surface.



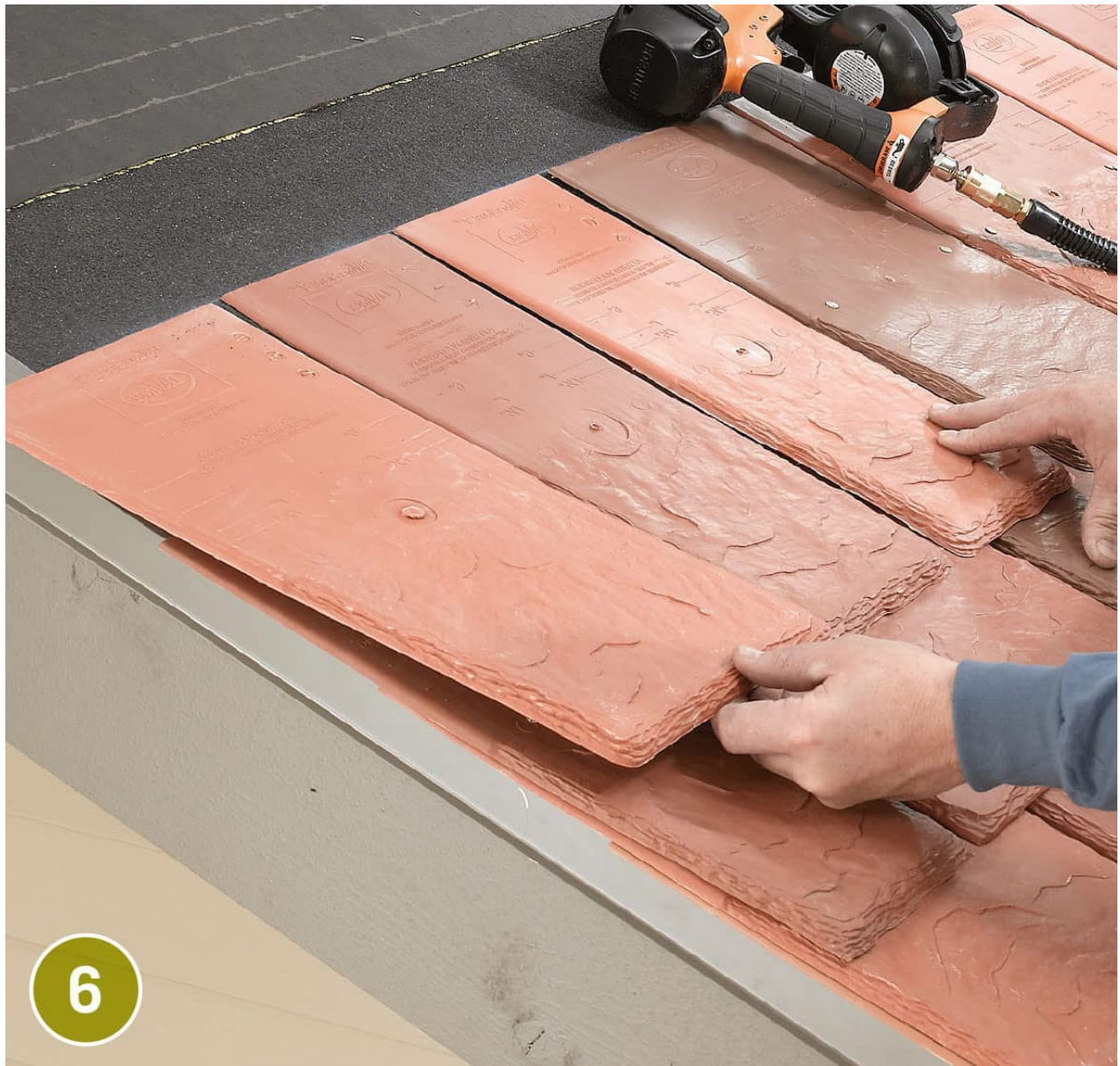


Use the exposure alignment guides and nailing guides as you begin the second course. Always check that  $\frac{3}{8}$ " gaps are maintained and overlapped by at least  $1\frac{1}{2}$ " by shingles.



As a quick guide, strike a chalkline for each course. It is easier to spot while shingling, although it's worthwhile to confirm you are on track by occasionally checking the alignment guides on the faux shingles.





Try to avoid cutting a shingle at the end of a course. Instead, vary the gap from  $\frac{3}{16}$ " to  $\frac{1}{2}$ " as you near the gable rake to finish a course without cutting. If a cut is necessary, use a utility knife and a straight edge or a circular saw equipped with a carbide-tipped blade, two teeth per inch.

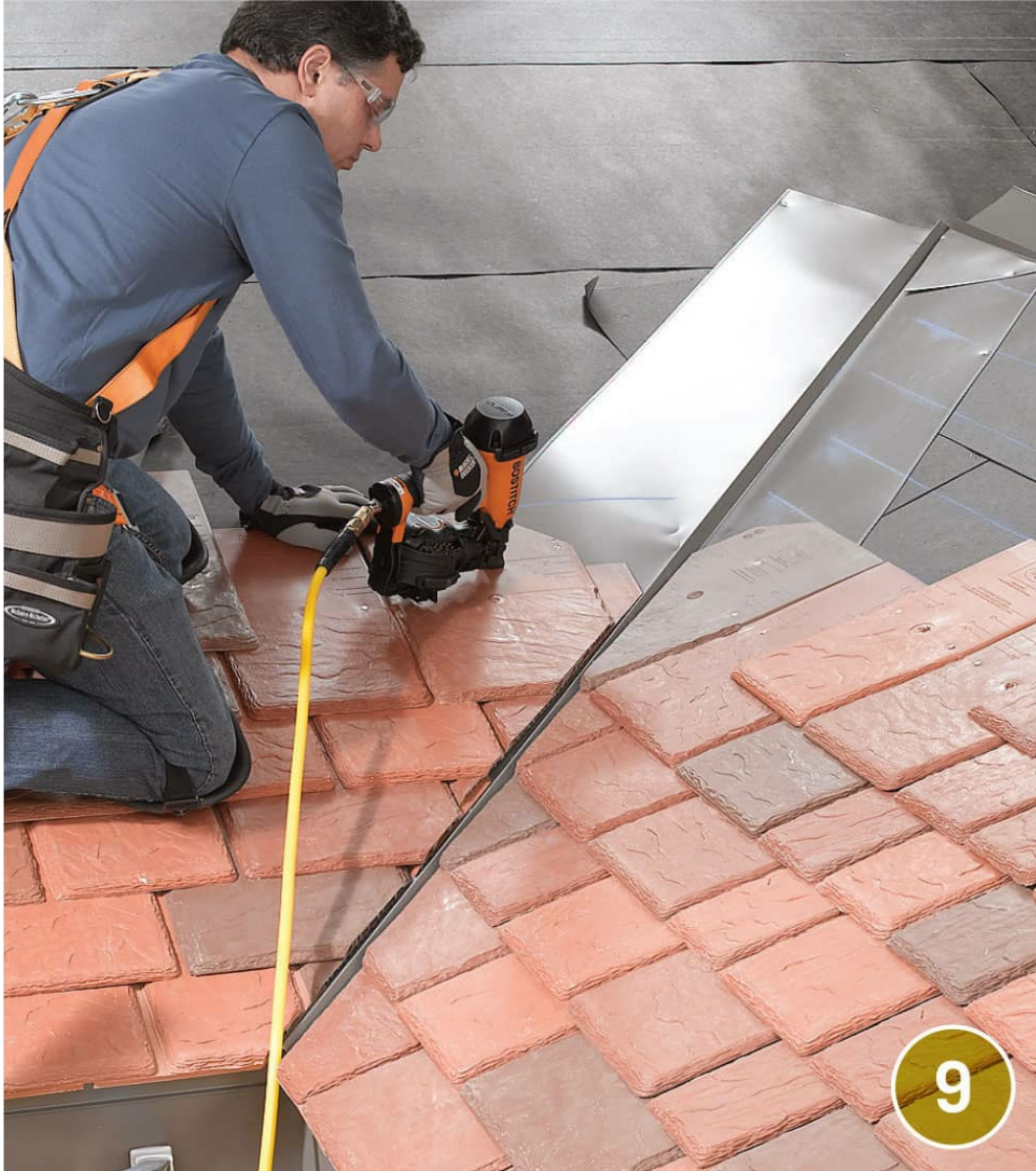


To make a closed valley, install 28"-wide "W" flashing. Run the courses to within a couple of shingles of the valley. Carefully measure so that a wide (10"- or 12"-) shingle will be trimmed for the valley. Mark a cut line just shy of the base of the valley ridge. For an open valley, use "Double W" flashing (see [here](#) for different types of flashing).





Cut the shingles where marked. Also make a 45° cut at the upper corner nearest the valley center. This helps divert toward the valley any water forced under the shingle.

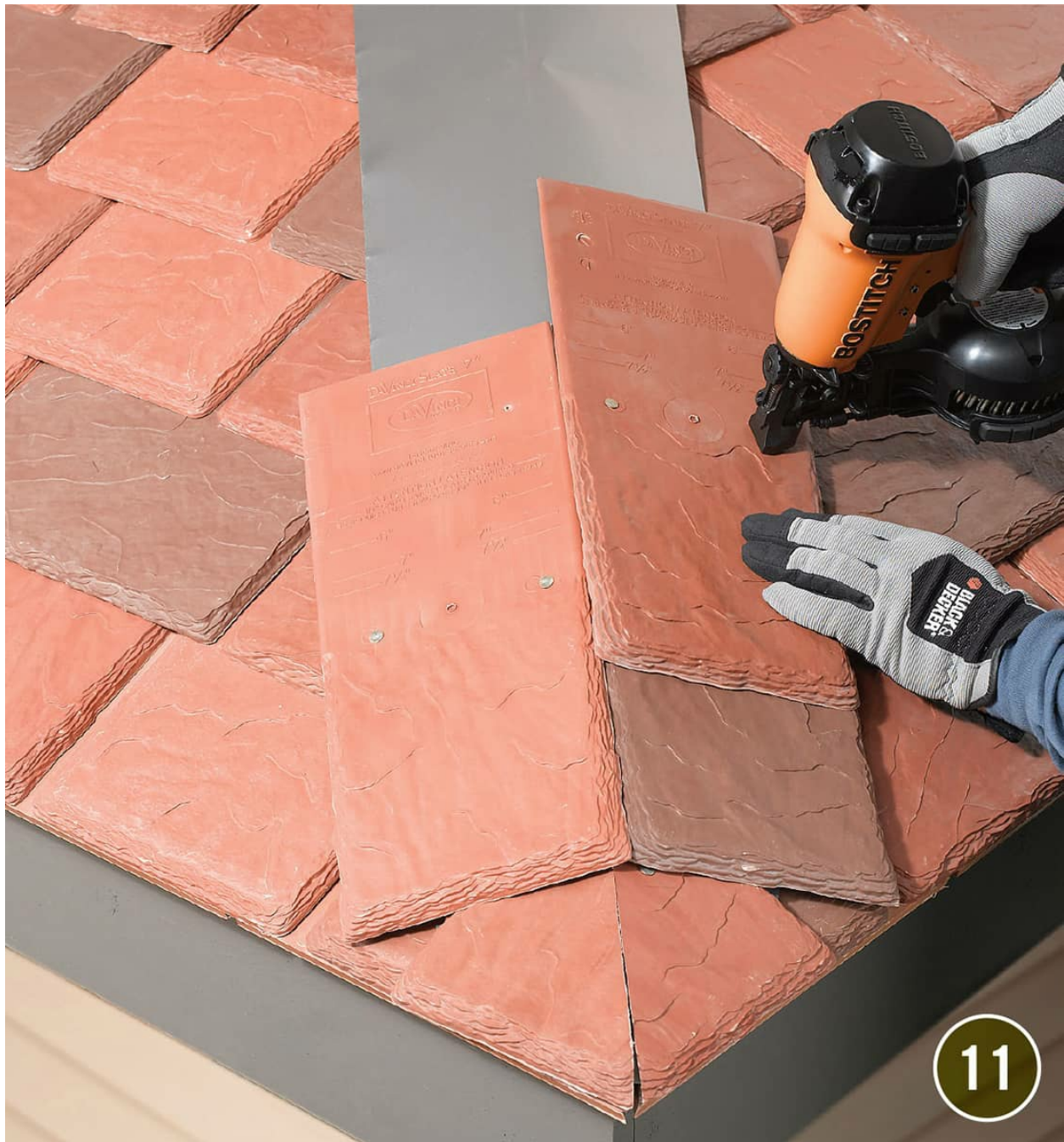


**Nail valley shingles**, maintaining the 3/8" gap from the next shingle in the course. Nail no closer than 5" from the valley flashing ridge.





**10** Cut starter triangles for hip ridges. After applying metal flashing to the ridge, apply the starter triangles. Nail 7" up from the bottom edge of the triangle and close to the outer edge of the flashing.



Use 7" shingles to complete the hip, fastening with two nails per shingle. Begin by lining up the shingle edge with the eave. Use a 6" exposure. Some manufacturers offer preformed hip and ridge shingles.





**12** Shingle the ridge using 7" slates over continuous ridge vent using a 6" exposure. Vary the exposure slightly if needed to terminate the ridge with a shingle cut to 6".



## Tile Roofing

Modern clay tiles use an S-type design rather than the two-piece system that was once common. This simplifies the installation process and saves you time. Due to the contour of the tiles, you'll need plumbing vents and air vents that match the shape of the roofing materials.

Before starting the project, make sure your roof framing can support the weight of the tiles. The materials are very heavy, and roofs designed for asphalt shingles may not have the structural support for clay tile. Check with your building inspector if you're unsure.



Clay tiles give homes a truly impressive roof that can't be imitated by other materials. The S design makes installation easier and less time-consuming. Each tile simply overlaps the preceding tile.

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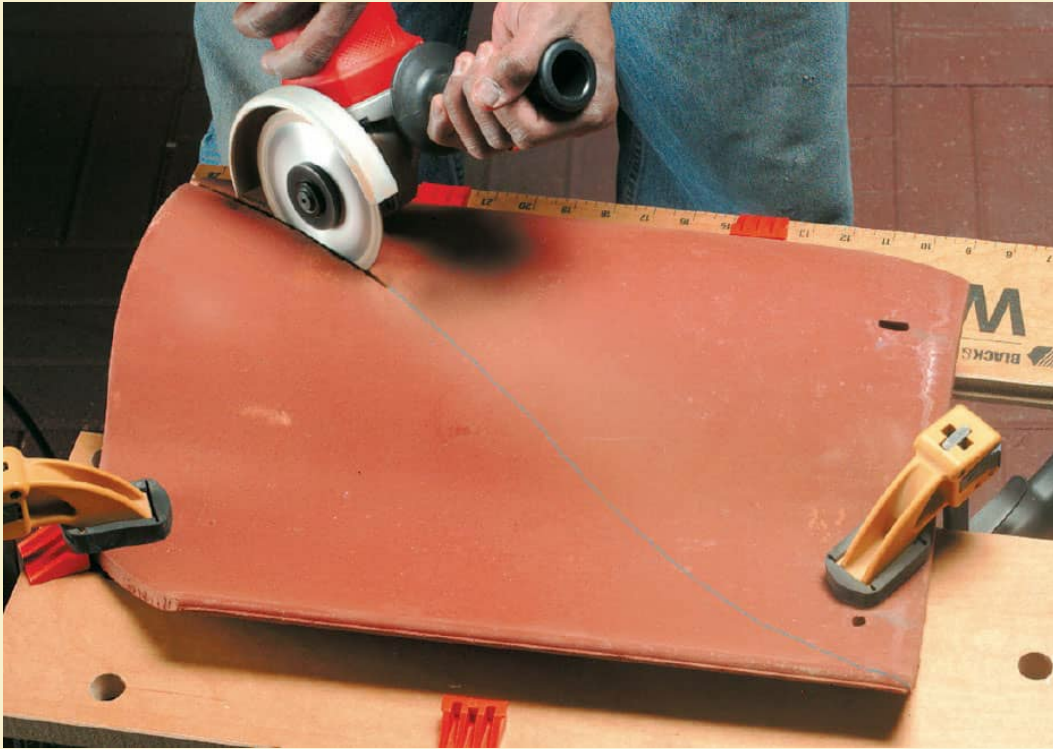


## TOOLS & MATERIALS

Hammer  
Tape measure  
Chalkline  
Circular saw  
Jigsaw  
Trowel  
Diamond saw blade  
Caulk gun  
30# felt paper  
Ice and water shield  
Nailers (2 × 6, 2 × 3, 2 × 2)  
¾" roofing nails  
Roofing nails  
Sand  
Portland cement  
Premixed cement mortar or Type M  
Lime  
Tile  
Bird stops  
Plumbing vents  
Air vents  
Roofing sealant  
Peel-and-stick flashing  
Plastic cement



## TIPS FOR INSTALLING A TILE ROOF



To cut clay tile, use a diamond blade in a circular saw or grinder. Clamp the tile to a work surface, make your cutting line on the tile, then cut along the line. Be sure to wear safety glasses and a respirator when making the cuts.





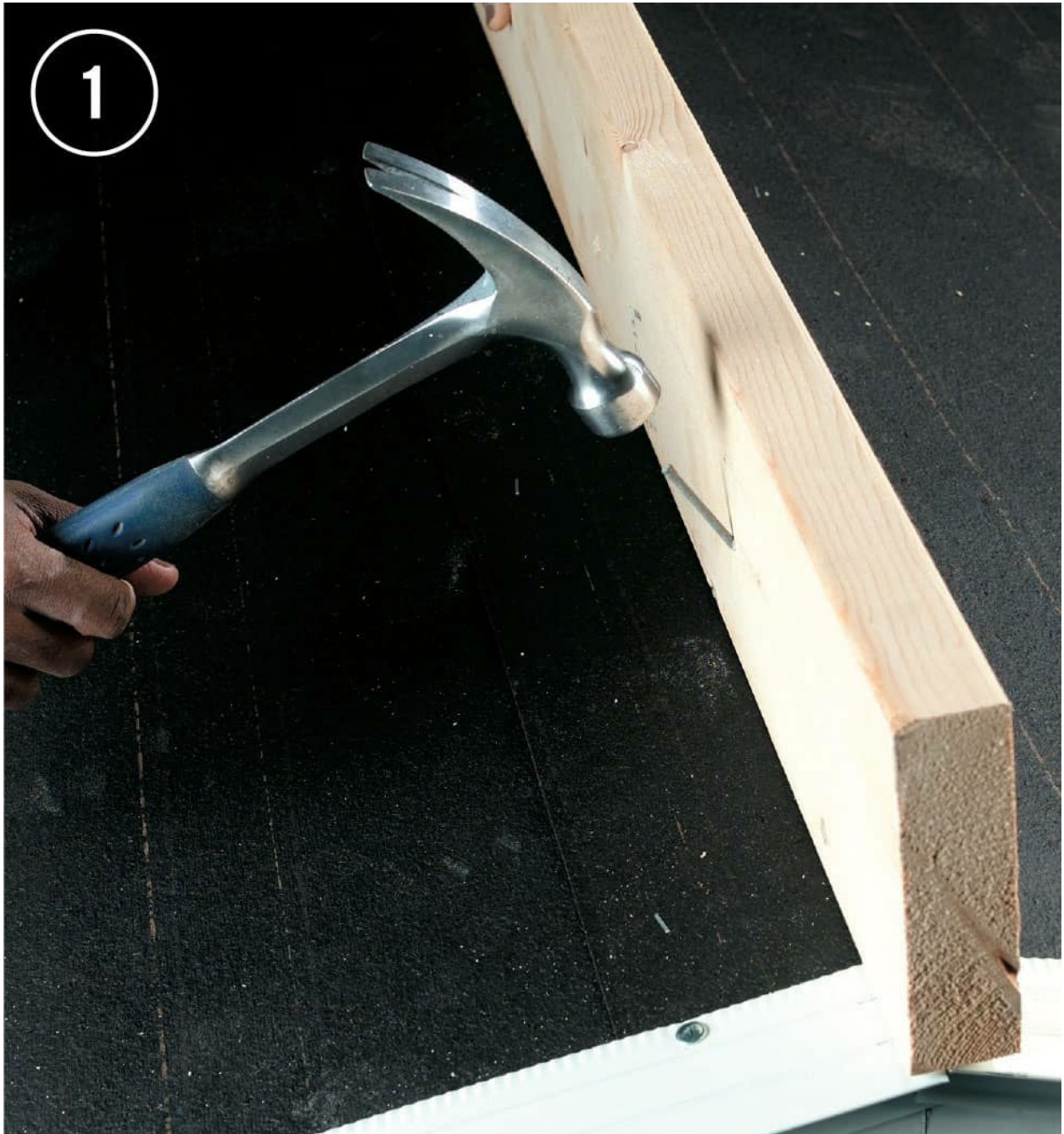
Mortar is available premixed, or you can mix it yourself. This project requires cement mortar Type M. To mix it, combine 3 parts portland cement, 1 part lime, and 2 parts sand. Add water and mix until the consistency is like mashed potatoes.



Clay tiles are beautiful, but be sure the roof framing is strong enough to support this heavier roofing material.



## How to Install a Tile Roof

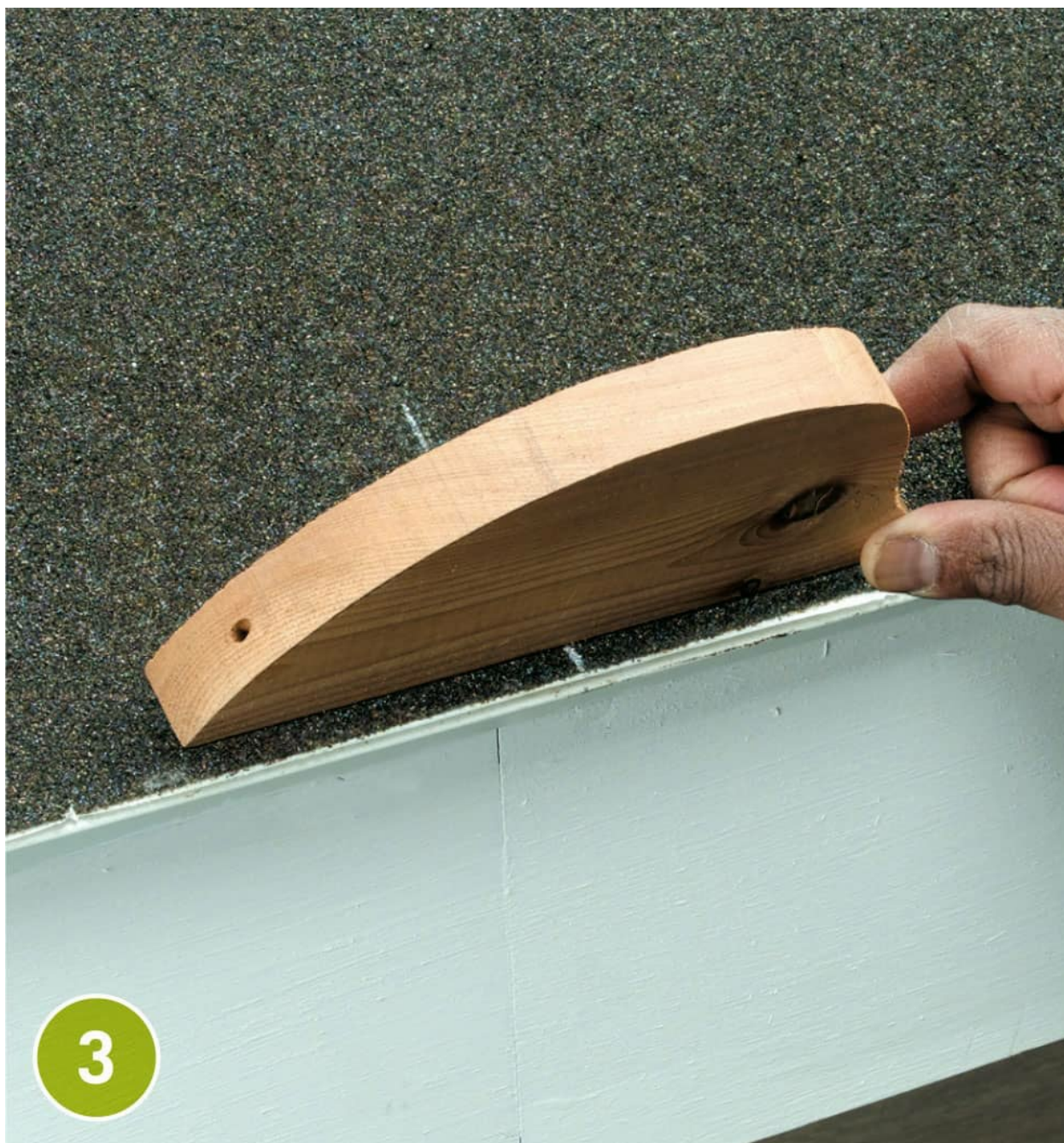


Cover the roof with underlayment (shown [here](#)). Install drip edge (shown [here](#)) and valley flashing (shown [here](#)). Nail 2 × 6 lumber on the edge over all ridges and hips.



Install 2 × 2 nailers along the rake edges of the roof. Butt 2 × 3 nailers against the 2 × 2s, and nail them in place.

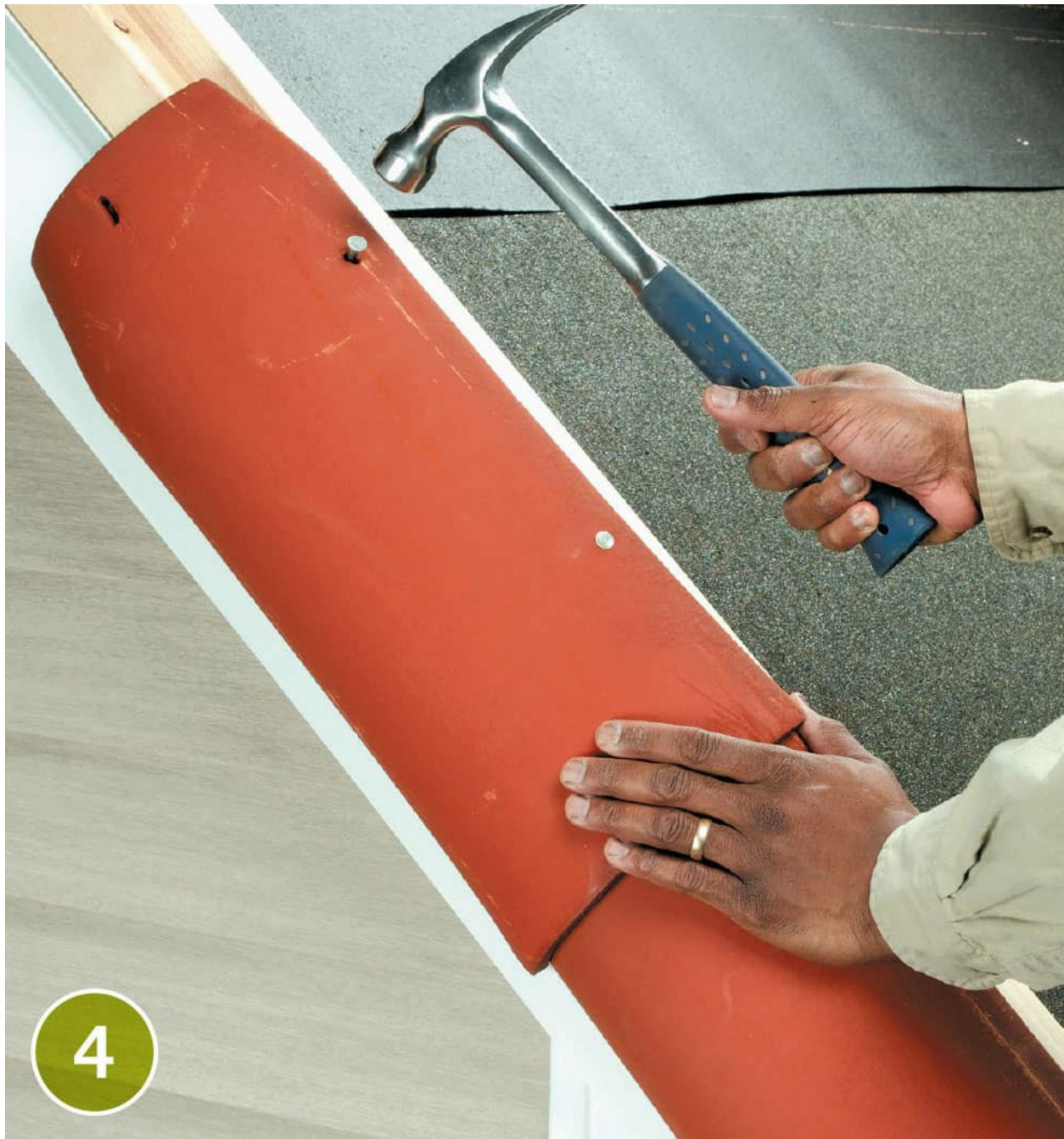




Measuring from the outside edge of the 2 × 3 nailer along the left rake edge, make marks on the roof every 12". Center a bird stop over each mark, aligned with the front edge of the roof, and nail in place.

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**NOTE:** Bird stops are available from the tile manufacturer, or you can cut your own from wood.

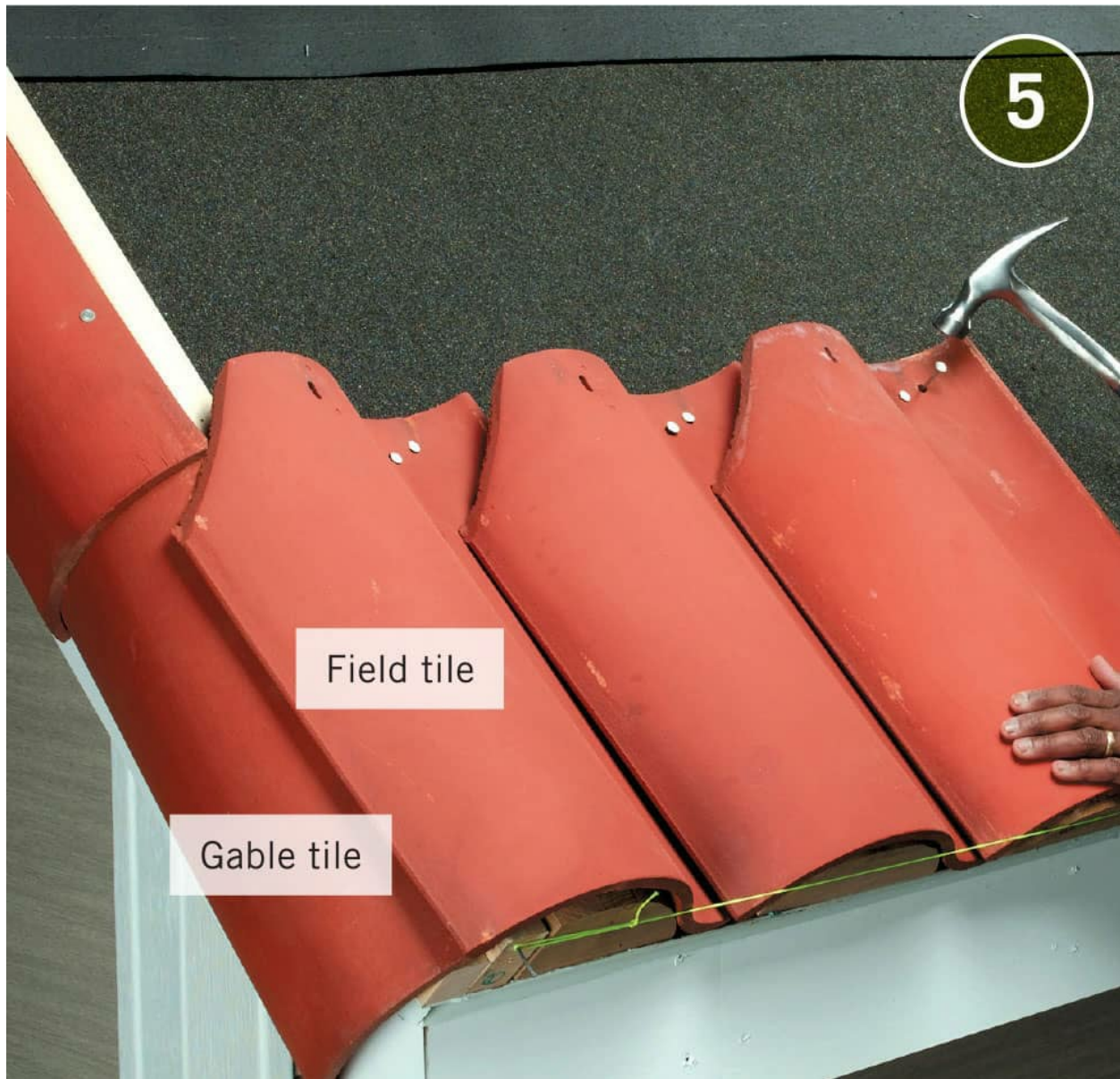


Place gable tile over the 2 × 2s along the rake ends of the roof, overhanging the front of the roof by 3". Nail in place, using two  $\frac{3}{4}$ " roofing nails per tile. Overlap tiles by 3".

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**NOTE:** Be sure to use left gable tiles for the left side and right gable tiles for the right side.





Starting on the left side of the roof, place the first field tile over the gable tile and 2 × 3 nailer. Align the end of the field tile with the end of the gable tile. Nail in place with two nails. Install the first course of tiles the same way, placing them over the bird stops.

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**TIP:** To ensure alignment, tie a string across the end of the first gable tiles. Set the tiles flush with the string. Move the string to align subsequent rows.



Install the next row of tiles on the roof, overlapping the first course by 3". Install remaining courses the same way. Avoid stepping on or walking on tiles as they break easily. When you can no longer reach new tiles from below, begin to work from higher up the roof. Work around obstacles as you encounter them, as seen in the remaining photos.





At dormers, chimneys, and walls, install pan flashing at least 4" up the wall and a minimum of 6" along the roof. Turn up the outside edge of the flashing 1½". Install counter flashing over the pan flashing.

**NOTE:** The top edge of the counter flashing must be installed under the wall siding or placed in the mortar between bricks in the chimney. The flashing may still be present from the old roof.

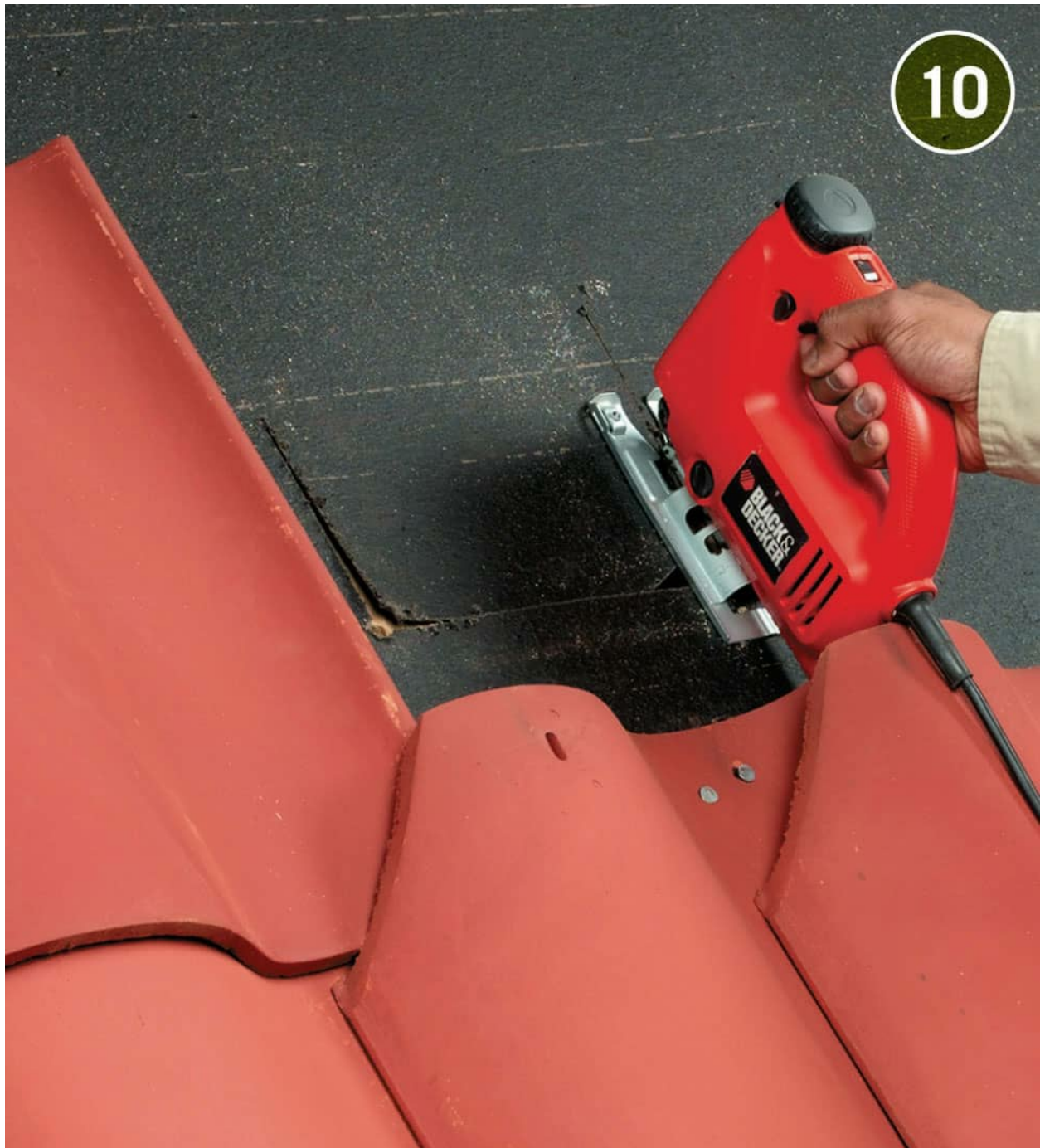


Install a 2 × 3 nailer along the turned-up edge of the pan flashing. Set the tile over the nailer and nail it in place.





When the roofing abuts a wall of the house, install tile up the roof to the wall. Apply mortar generously between the tops of the tiles and the wall, filling in any gaps. Place 3 × 4 flashing over the mortar, then place counter flashing over that.

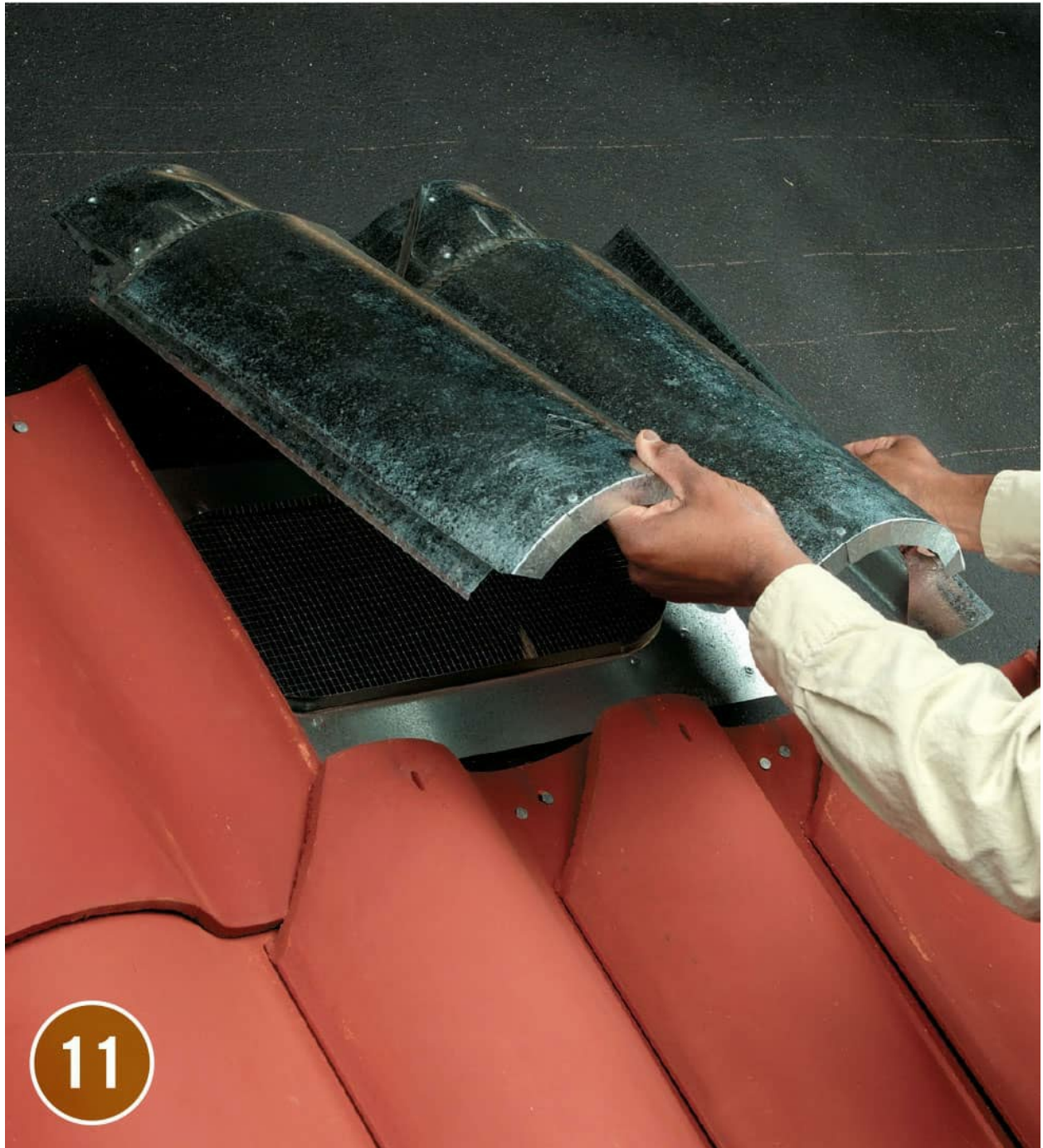


**Mark roof vent locations** between rows of tiles and between rafters. Follow manufacturer's guidelines for the size of the opening. Cut out the opening using a jigsaw or circular saw.

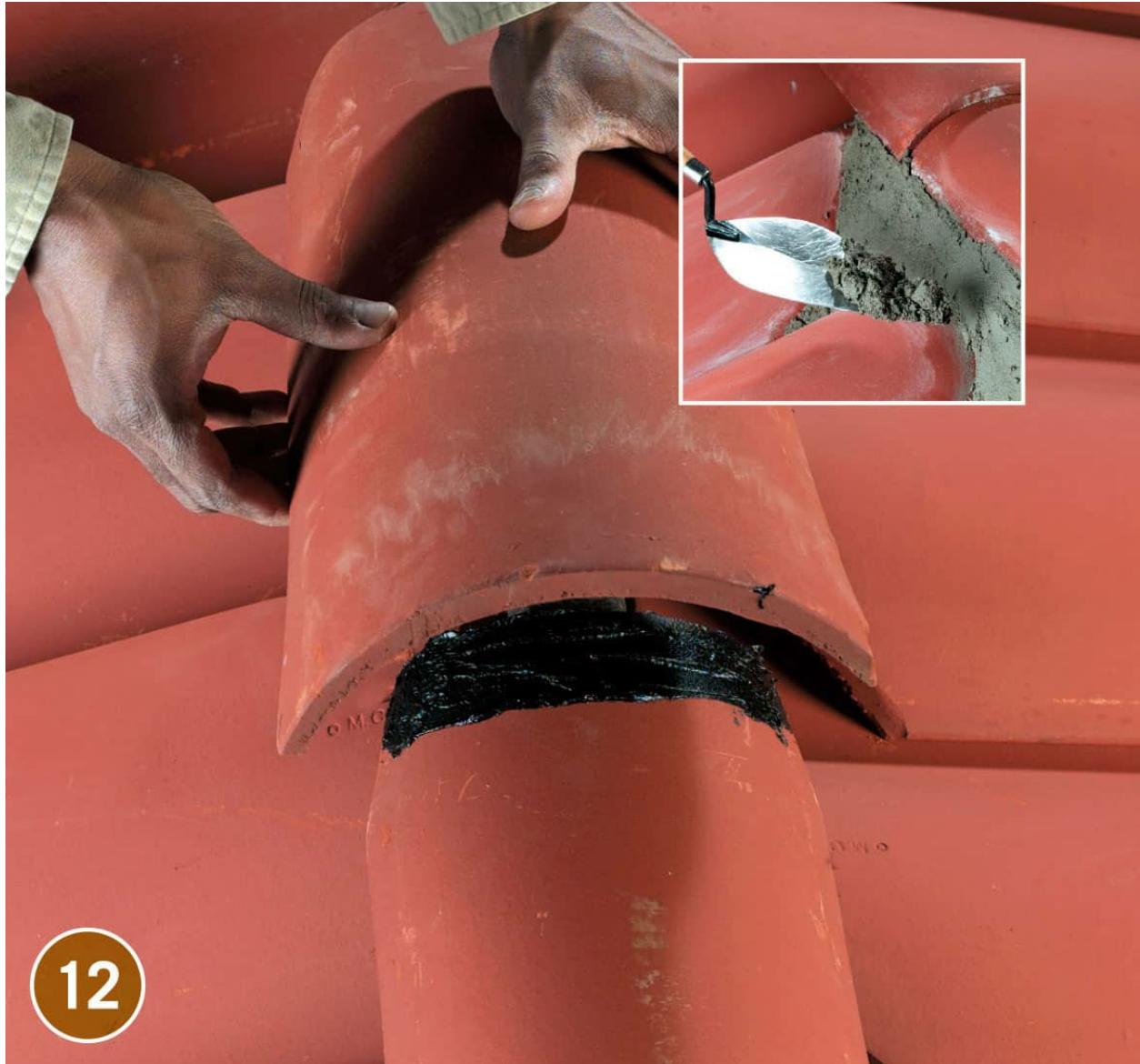
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**TIP:** Periodically look at the roof from the street to make sure the rows are running straight and the tiles look uniform.





Apply roofing sealant along the bottom of the primary roof vent, then install it over the opening using roofing nails driven every 4" through the flange. Seal the flange with peel-and-stick flashing. Place the secondary vent over the primary vent, and nail it to the roof. Overlap the lip with the next piece of tile.

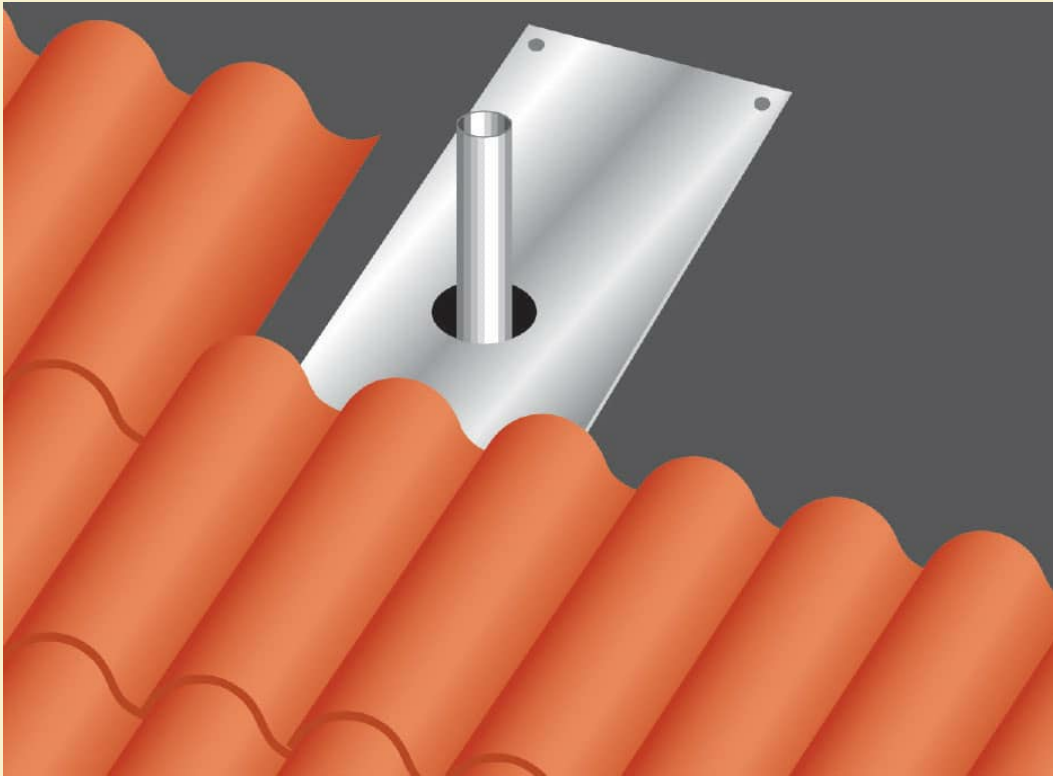


**Center ridge tiles over the hips and peak.** Apply a small amount of plastic cement on the nose of each ridge tile. Overlap the tiles for a 16" exposure, placing the tile over the plastic cement on the previous tile. Nail the ridge tiles using two nails per tile. Fill the gaps beneath ridge tiles with mortar (inset photo).

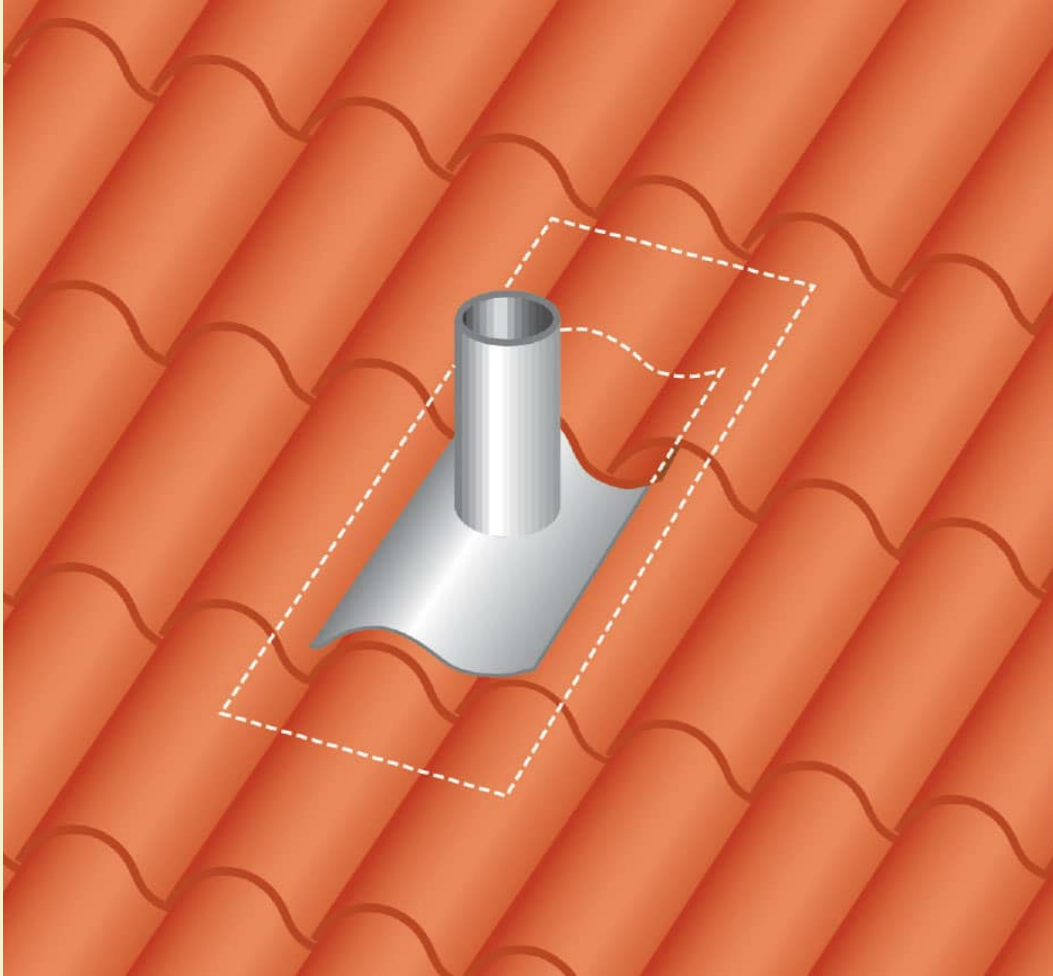




## TILING AROUND A VENT



Place primary metal flashing over a plumbing vent, and nail in the corners. Install tile over the front of the flashing.



**Cover the back of the flashing with building paper.** Install tile over the flashing and vent. Apply sealant along the underside of the secondary flashing, then place it over the tiles and vent. Overlap the back edge of the flashing with the next row of tiles.





Tile roofing is more expensive and labor-intensive to install, but few roofing materials offer a more stunning way to cover and highlight your house. The curb appeal is undeniable when a tile roof is installed correctly.



## Inspecting & Repairing a Roof

A roof system is composed of several elements that work together to provide three basic, essential functions for your home: shelter, drainage, and ventilation. The roof covering and flashing are designed to shed water, directing it to gutters and downspouts. Air intake and outtake vents keep fresh air circulating below the roof sheathing, preventing moisture and heat buildup.

When your roof system develops problems that compromise its ability to protect your home—cracked shingles, incomplete ventilation, or damaged flashing—the damage quickly spreads to other parts of your house. Routine inspections are the best way to make sure the roof continues to do its job effectively.



### TOOLS & MATERIALS

- Tape measure
- Wire brush
- Aviation snips
- Trowel
- Flat pry bar
- Hammer
- Utility knife
- Caulk gun
- Replacement flashing
- Replacement shingles
- Roofing cement
- Roofing nails



Plywood

Double-headed nails

Rubber gasket nails



## Tips for Identifying Roofing Problems



Ice dams occur when melting snow refreezes near the eaves, causing ice to back up under the shingles, where it melts onto the sheathing and seeps into the house.





**Inspect both the interior and the exterior of the roof to spot problems.** From inside the attic, check the rafters and sheathing for signs of water damage. Symptoms will appear in the form of streaking or discoloration. A moist or wet area also signals water damage.



## Common Roofing Problems



Wind, weather, and flying debris can damage shingles. The areas along valleys and ridges tend to take the most weather-related abuse. Torn, loose, or cracked shingles are common in these areas.





Buckled and cupped shingles are usually caused by moisture beneath the shingles. Loosened areas create an entry point for moisture and leave shingles vulnerable to wind damage.





A sagging ridge might be caused by the weight of too many roofing layers. It might also be the result of a more significant problem, such as a rotting ridge board or insufficient support for the ridge board.



Dirt and debris attract moisture and decay, which shorten a roof's life. To protect shingles, carefully wash the roof once a year using a pressure washer. Pay particular attention to areas where moss and mildew may accumulate. Seasonal application of moss killer is even more effective. Use only powders intended for roofs; grass types will stain roofing.





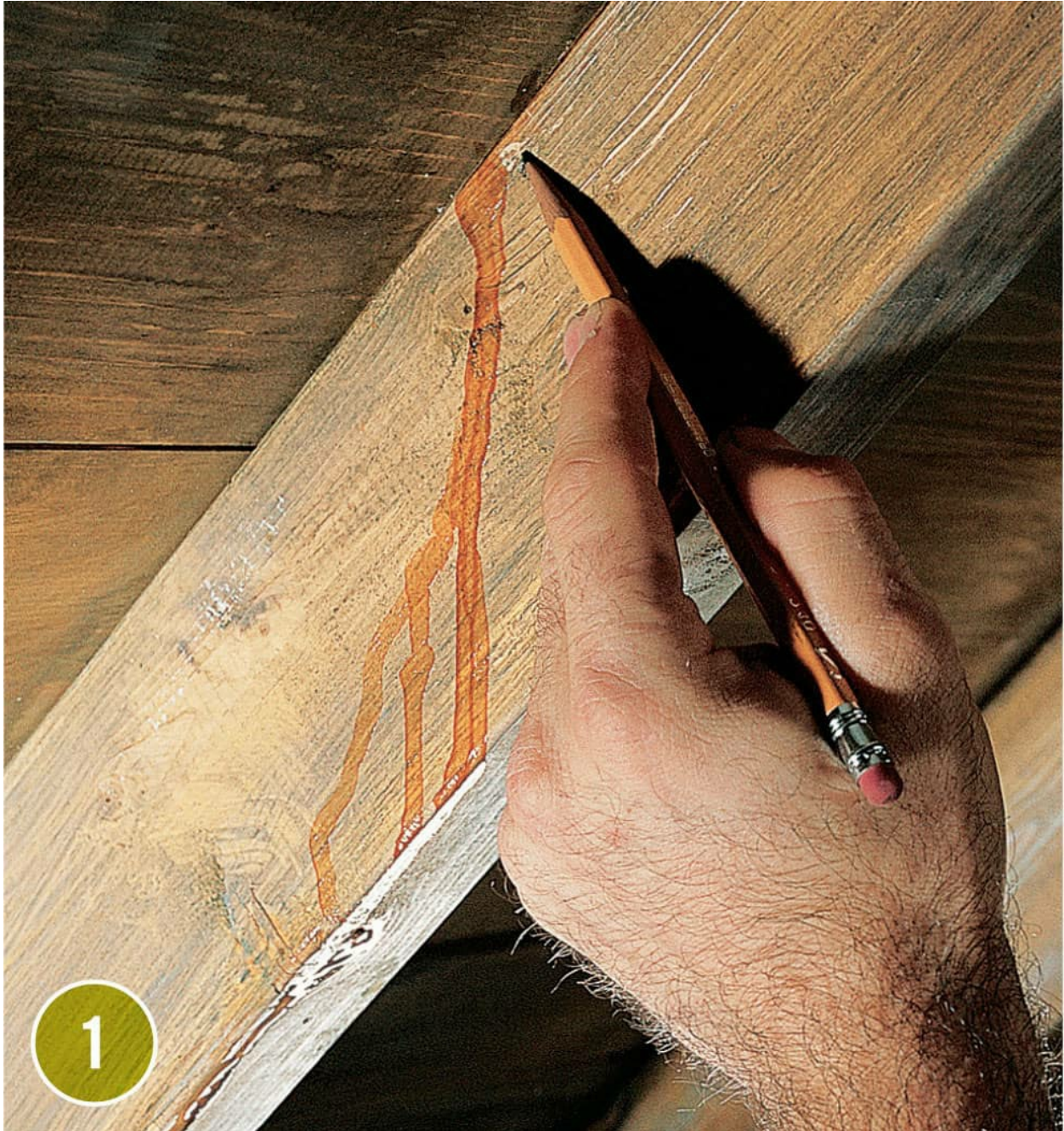
In damp climates, it's a good idea to nail a zinc strip along the center ridge of a roof, under the ridge caps. Minute quantities of zinc wash down the roof each time it rains, killing moss and mildew.



**Overhanging tree limbs** drop debris and provide shade that encourages moss and mildew. To reduce chances of decay, trim any limbs that overhang the roof.

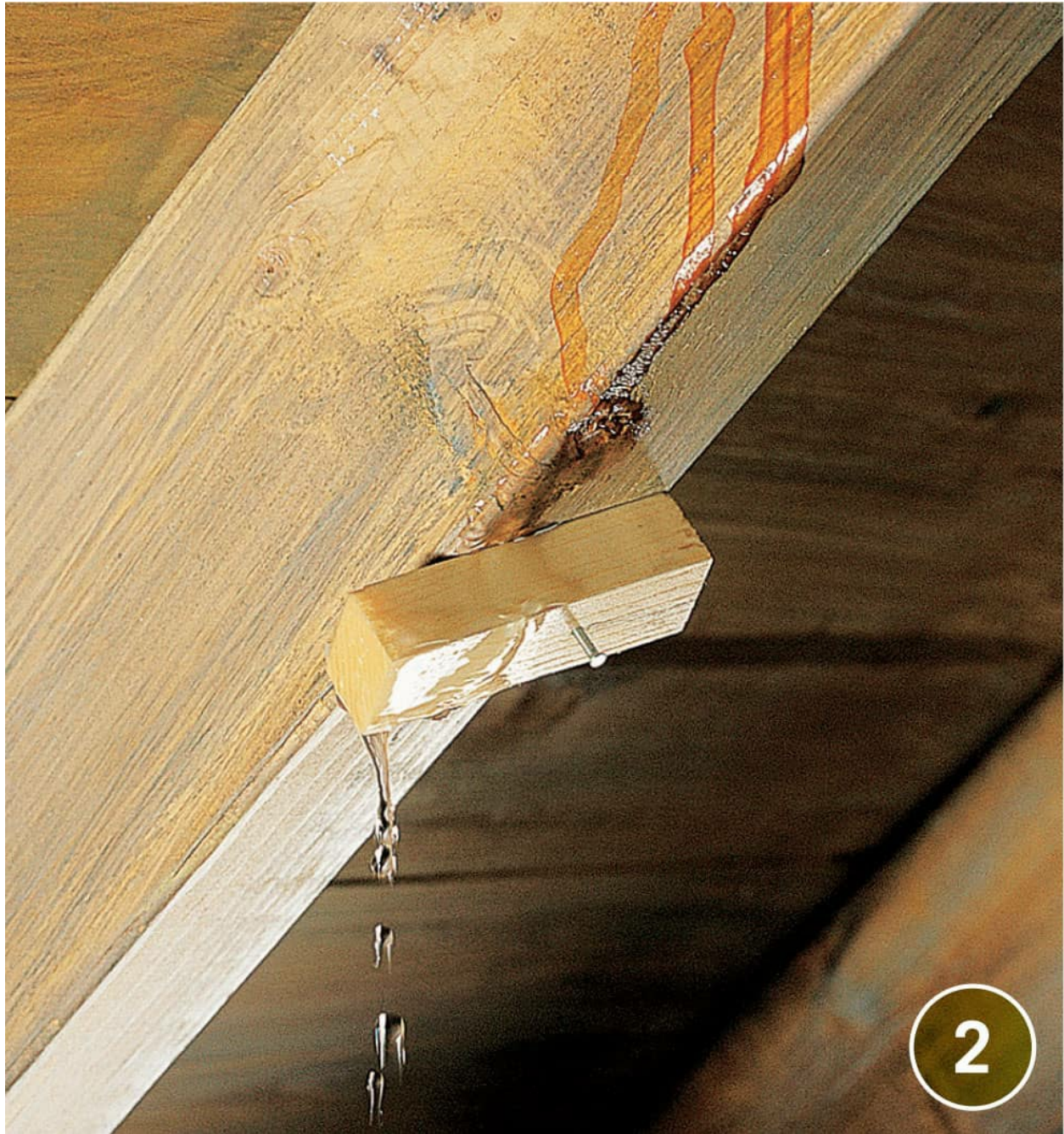


## How to Locate & Evaluate Leaks



If you have an unfinished attic, examine the underside of your roof with a flashlight on a rainy day. If you find wetness, discoloration, or other signs of moisture, trace the trail up to where the water is making its entrance.





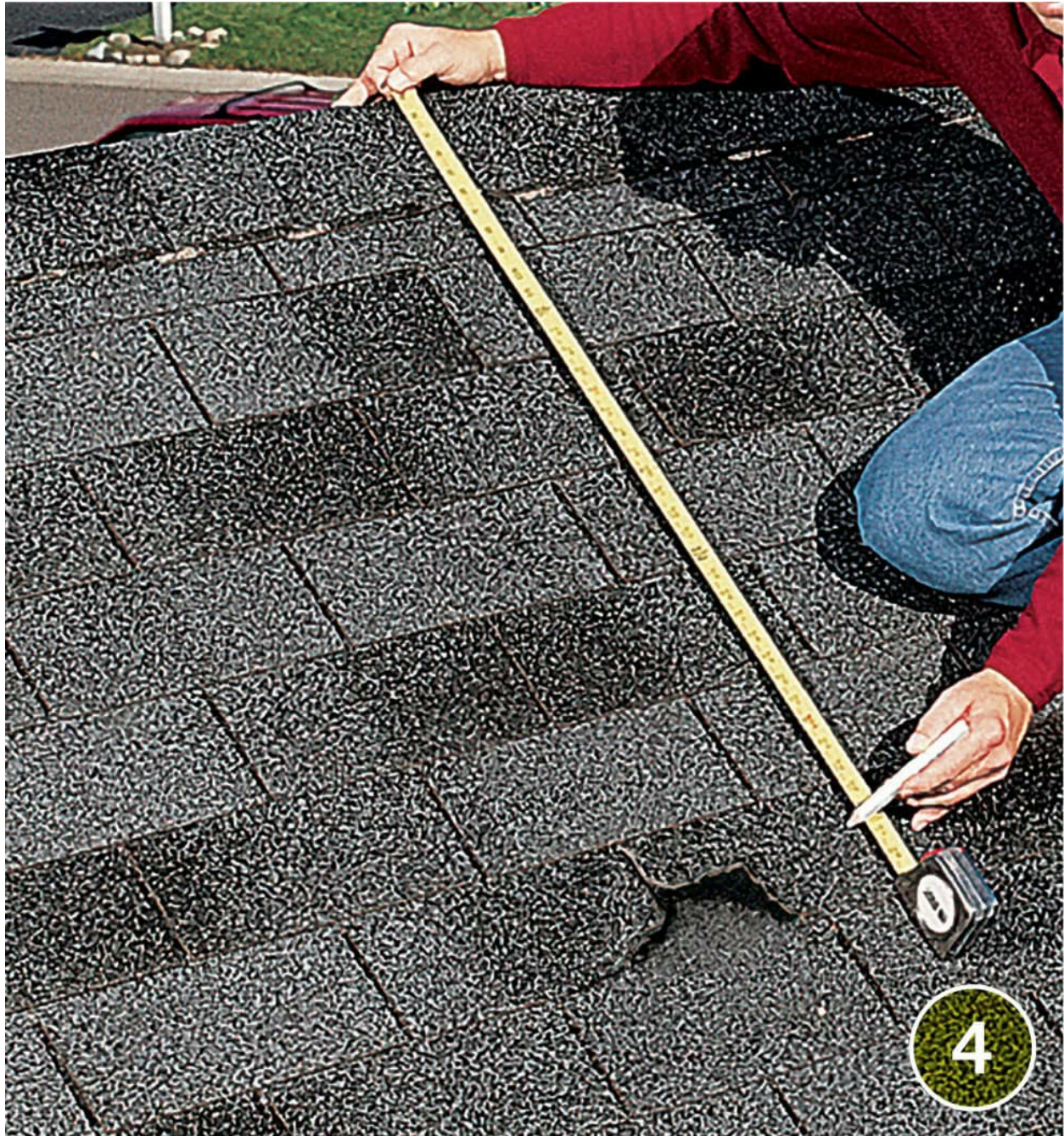
Water that flows toward a wall can be temporarily diverted to minimize damage. Nail a small block of wood in the path of the water, and place a bucket underneath to catch the drip. On a dry day, drive a nail through the underside of the roof decking to mark the hole.





If the leak is finding its way to a finished ceiling, take steps to minimize damage until the leak can be repaired. As soon as possible, reduce the accumulation of water behind a ceiling by poking a small hole in the wallboard or plaster and draining the water.

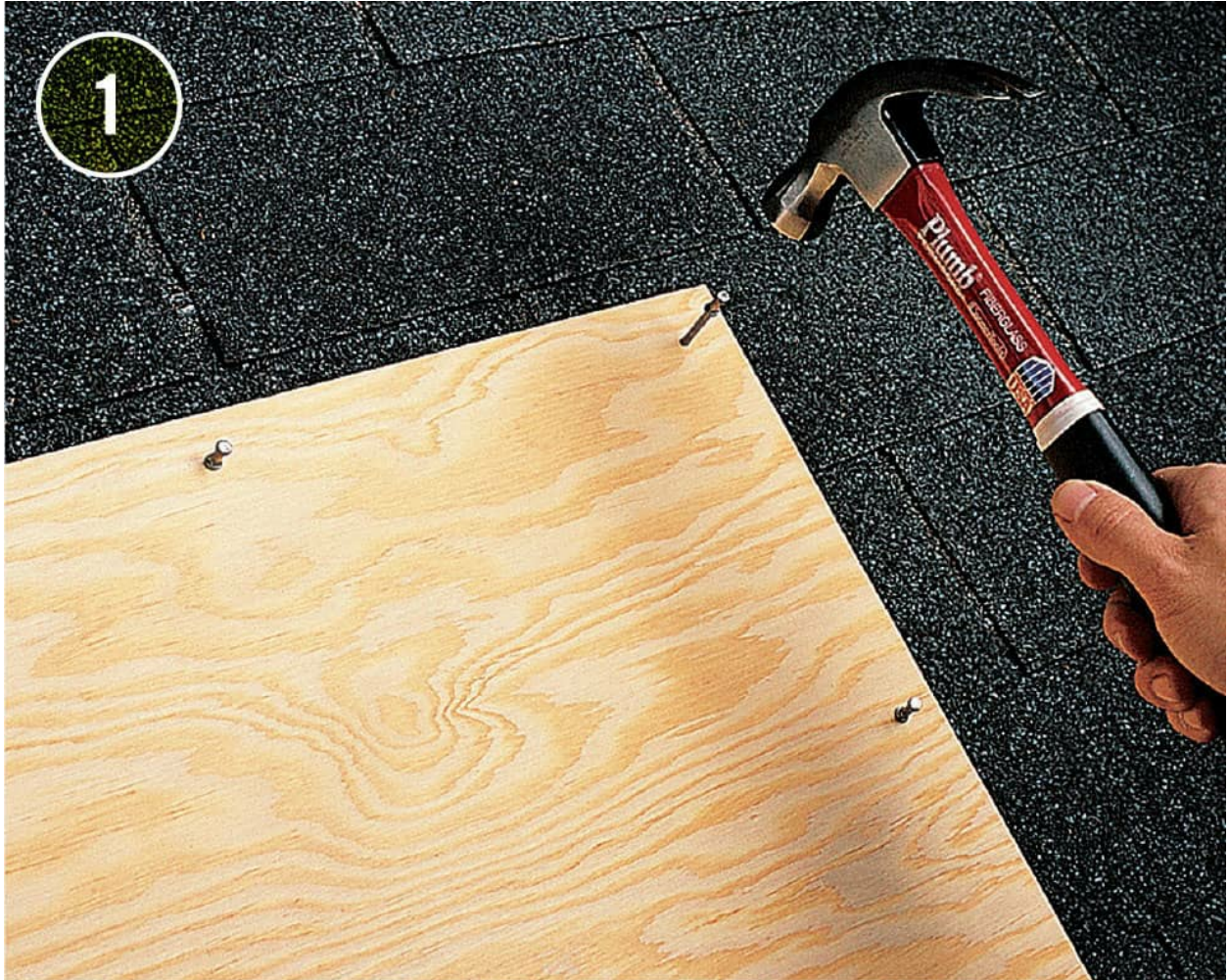




Once you mark the source of a leak from inside, measure from that spot to a point that will be visible and identifiable from outside the house, such as a chimney, vent pipe, or the peak of the roof. Get up on the roof and use that measurement to locate the leak.



# How to Make Emergency Repairs

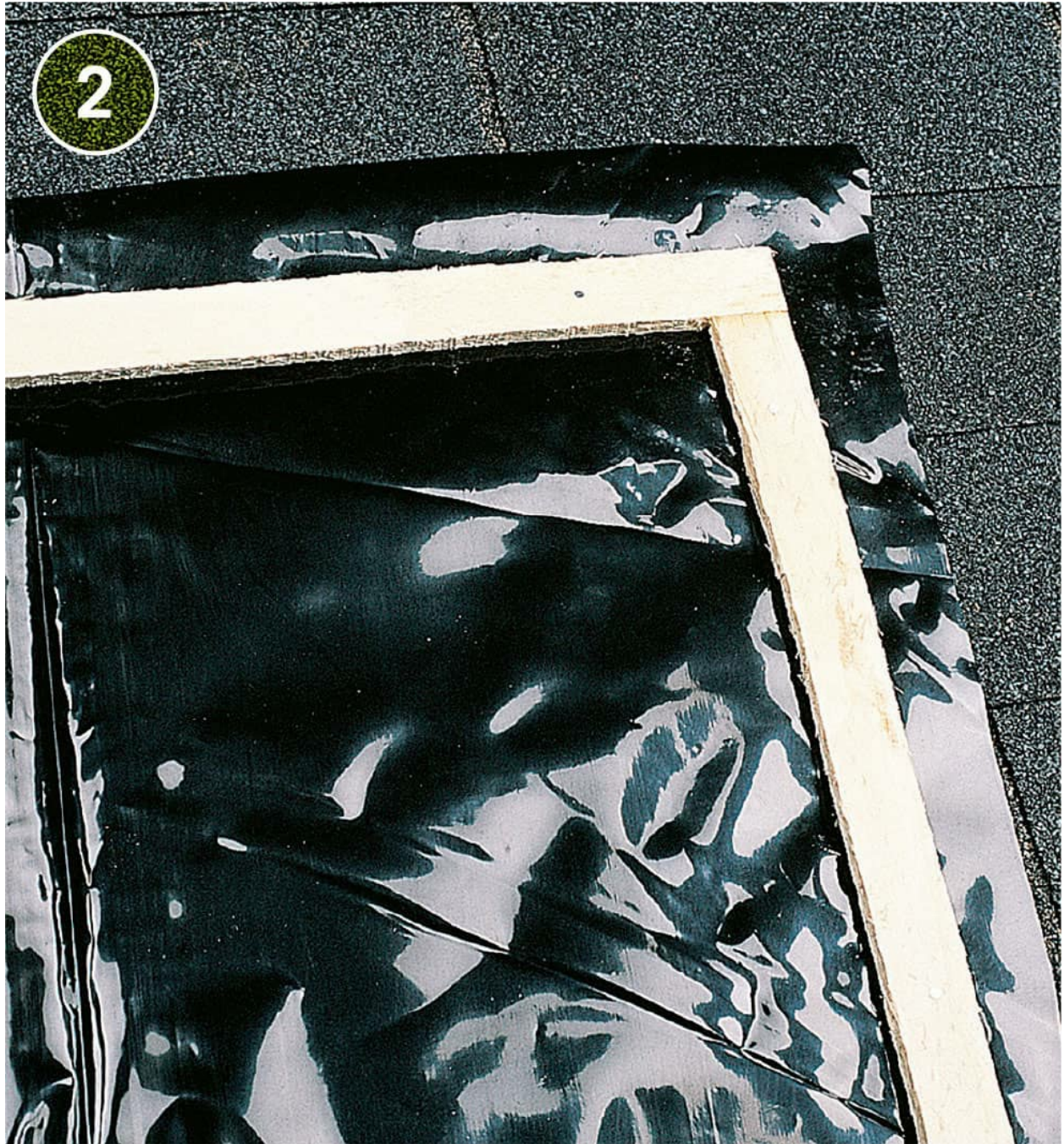


If your roof is severely damaged, the primary goal is to prevent additional damage until permanent repairs are made. Nail a sheet of plywood to the roof to serve as emergency cover to keep out the wind and water.

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**TIP:** For temporary repairs, use double-headed nails, which can be easily removed. Fill nail holes with roofing cement when the repair is complete.





Cover the damaged area by nailing strips of lath around the edges of a plastic sheet or tarp.



## How to Make Spot Repairs with Roofing Cement



To reattach a loose shingle, wipe down the felt paper and the underside of the shingle. Let each dry, then apply a liberal coat of roofing cement. Press the shingle down to seat it in the bed of cement.

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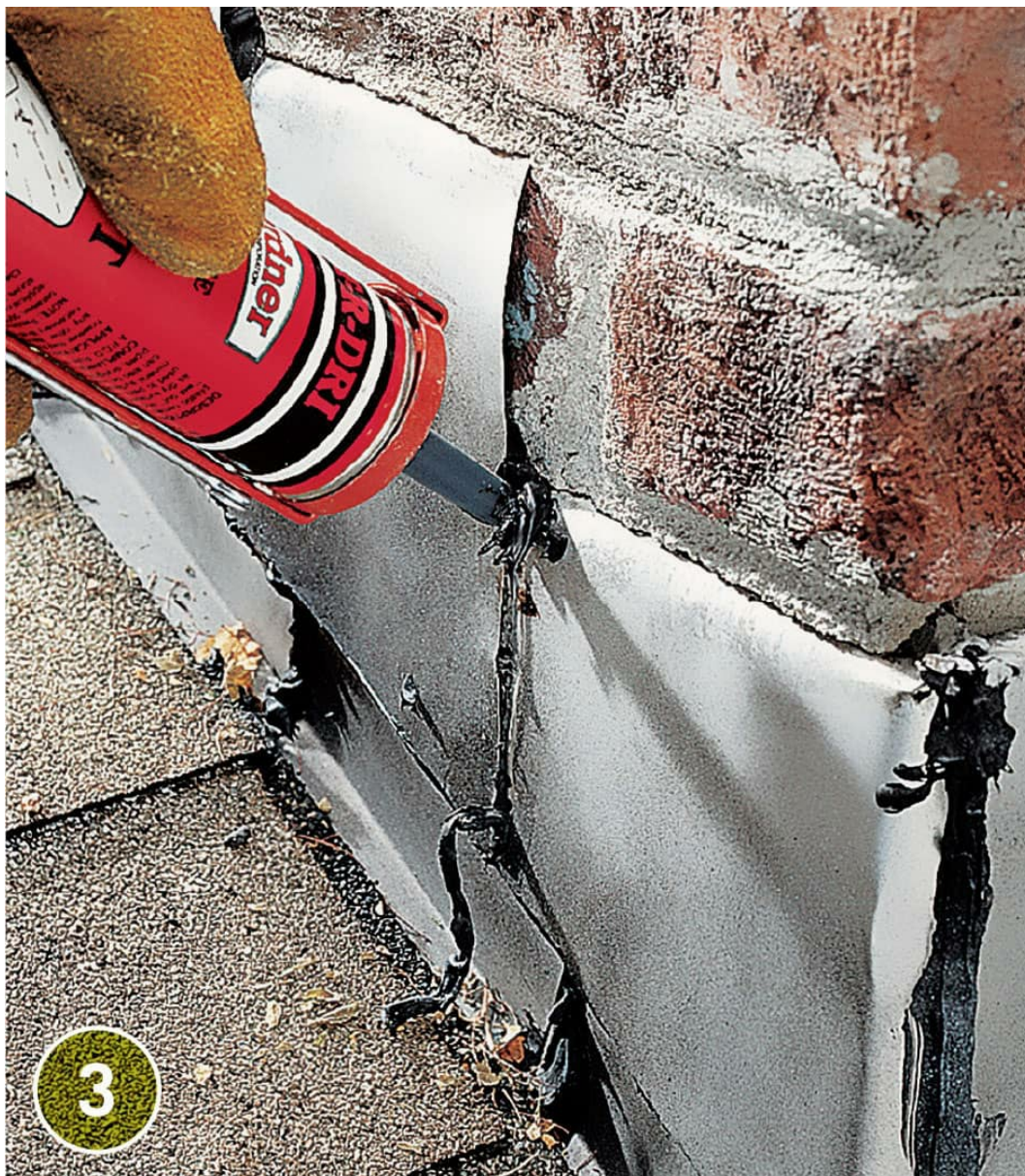
**TIP:** Heat softens the roof's surface, and cold makes it brittle. If needed, warm shingles slightly with a hair dryer to make them easier to work with and less likely to crack.





Glue down buckled shingles by cleaning below the buckled area, filling the area with roofing cement, then pressing the shingle into the cement. Patch cracks and splits in shingles with roofing cement.

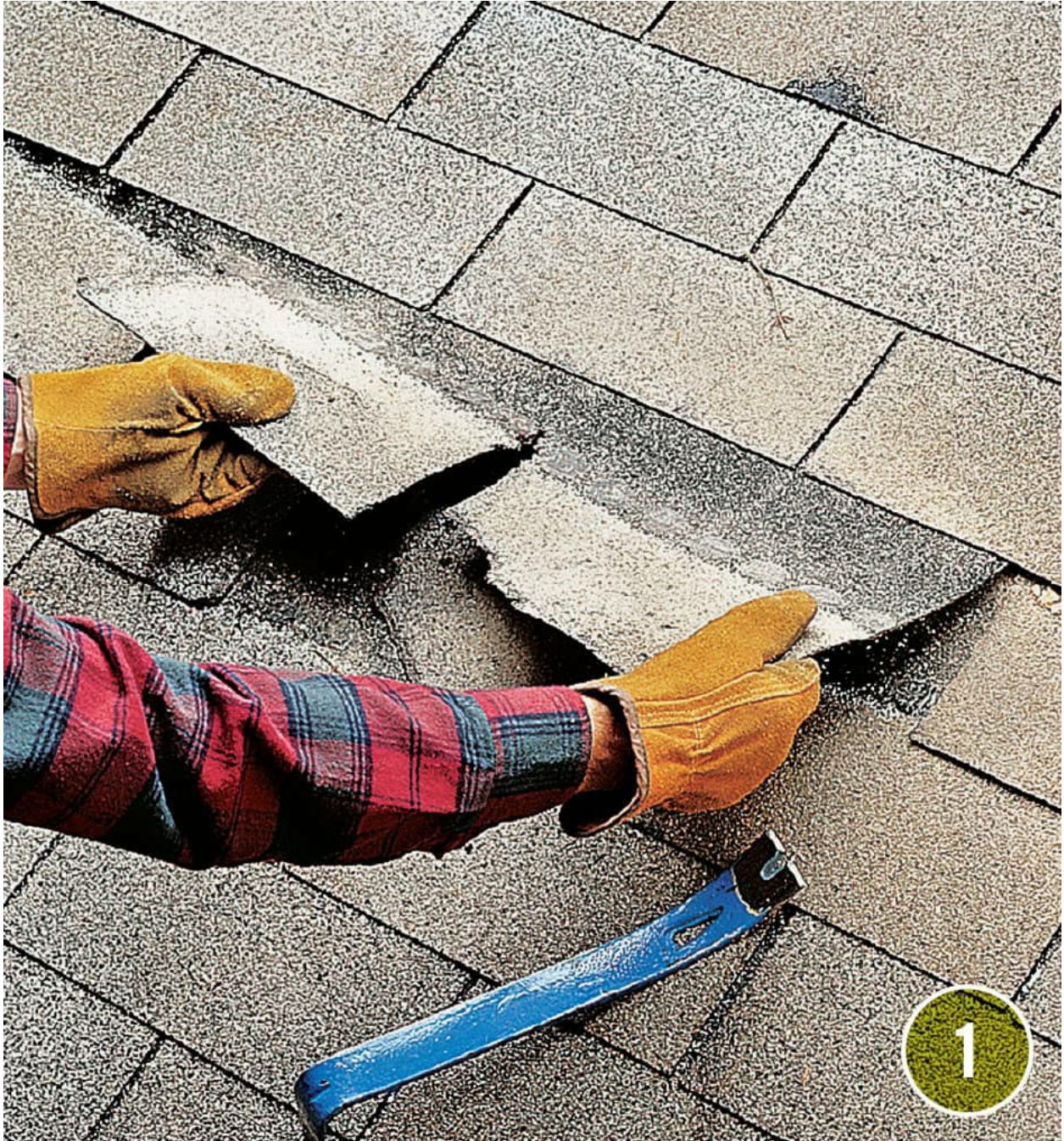




Check the joints around flashing, which are common places for roof leaks to occur. Seal any gaps by cleaning out and replacing any failed roofing cement.

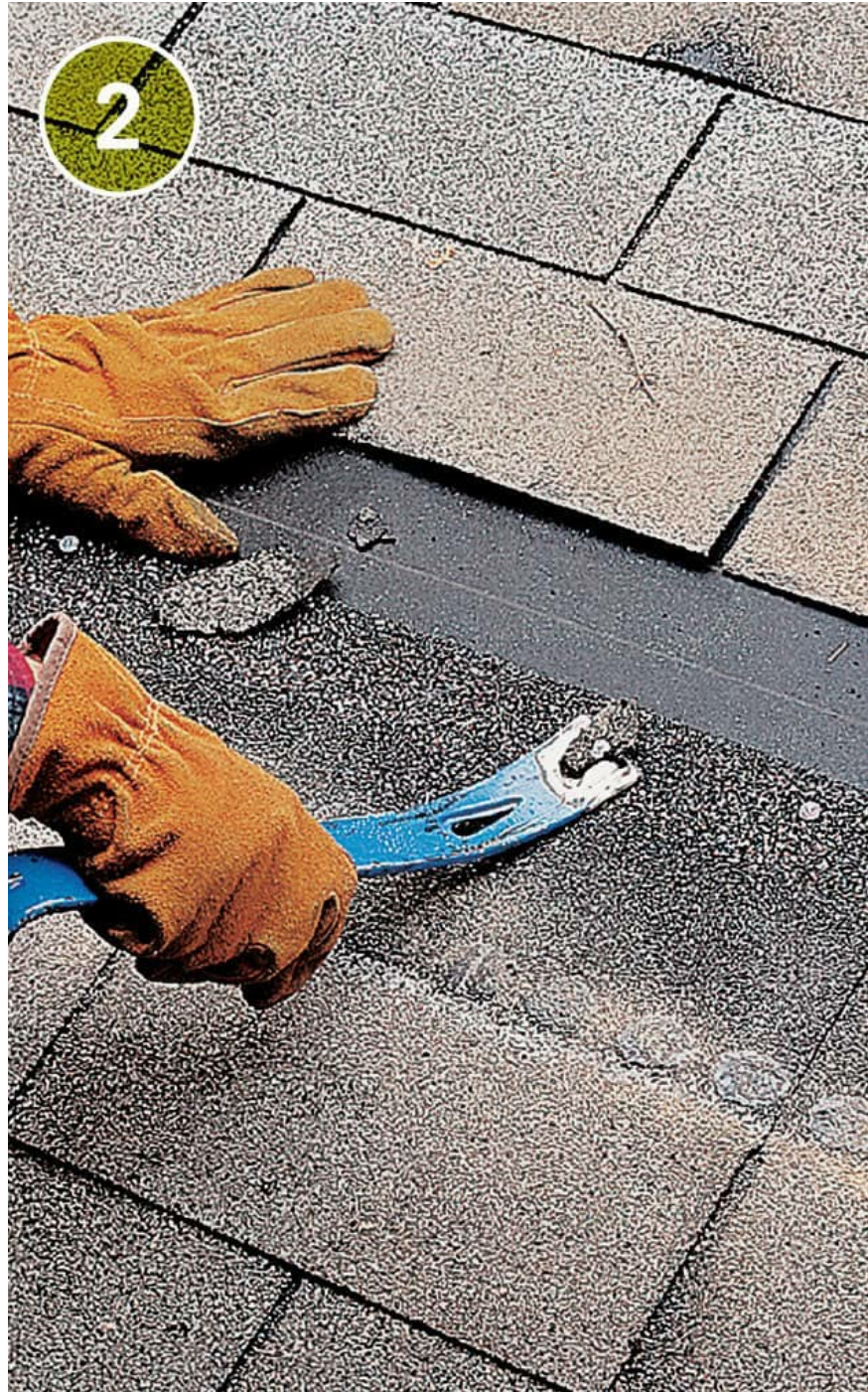


## How to Replace Asphalt Shingles



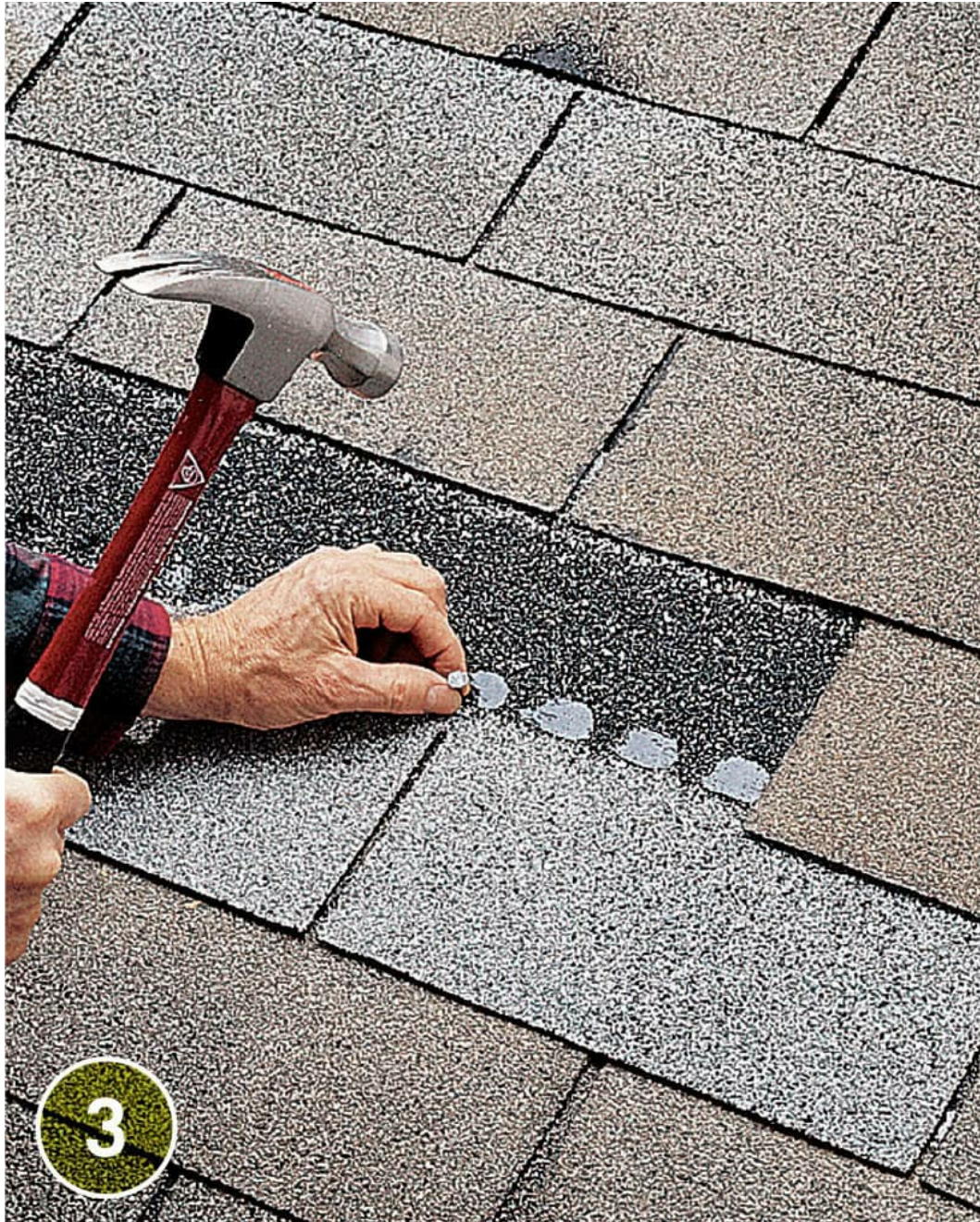
Pull out damaged shingles, starting with the uppermost shingle in the damaged area. Be careful not to damage surrounding shingles that are still in good condition.





Remove old nails in and above the repair area using a flat pry bar. Patch damaged felt paper with roofing cement.





Install the replacement shingles, beginning with the lowest shingle in the repair area. Nail above the tab slots using 7/8 or 1" roofing nails.





Install all but the top shingle with nails, then apply roofing cement to the underside of the top shingle, above the seal line.

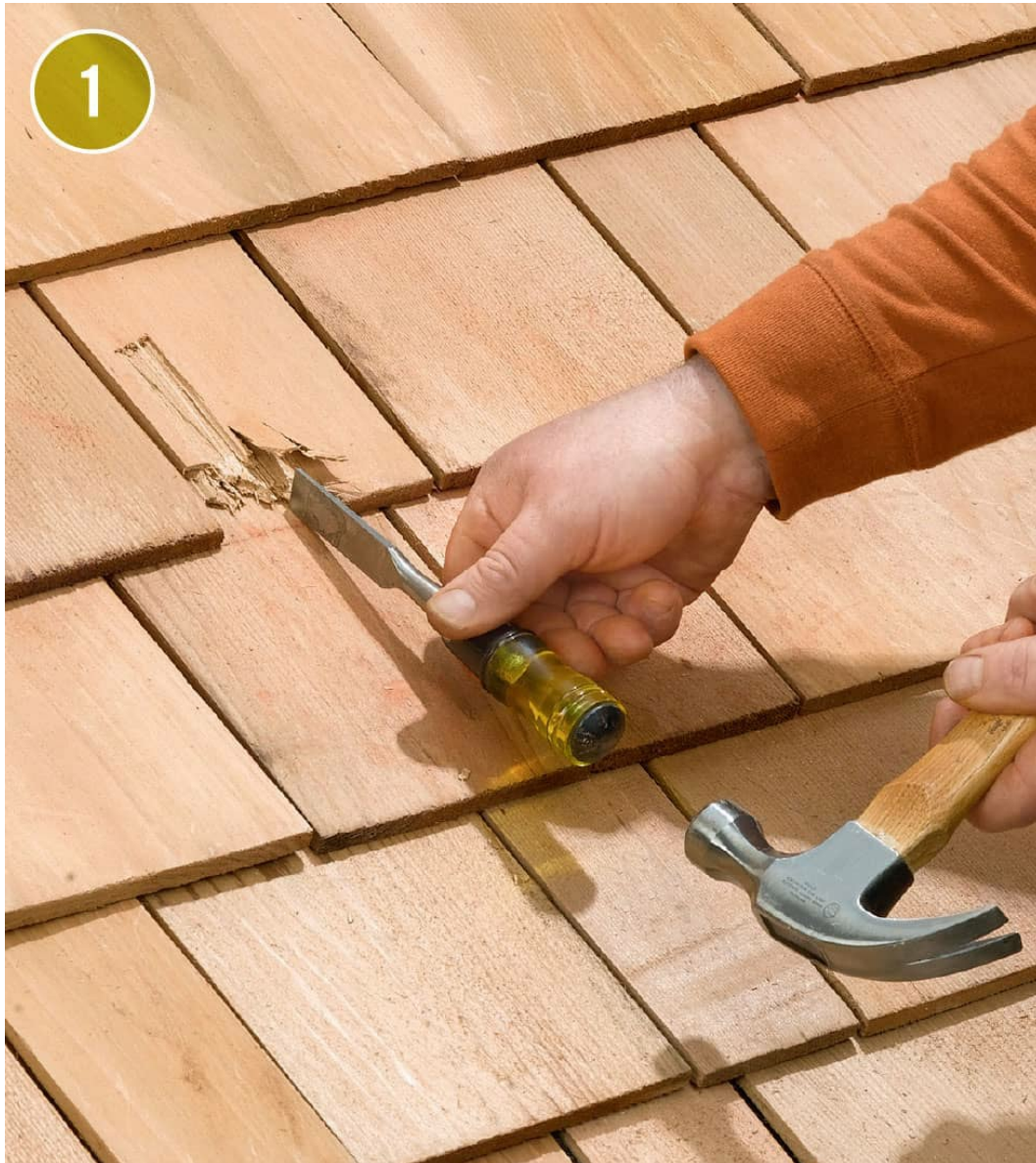




Slip the last shingle into place, under the overlapping shingle. Lift the shingles immediately above the repair area, and nail the top replacement shingle.



# How to Replace Wood Shakes & Shingles



Split the damaged wood shingles or shakes with a wood chisel and mallet so they can be removed.





Remove the pieces. Slide a hacksaw blade under the overlapping shingles and cut the nail heads. Pry out the remaining pieces of the shakes or shingles.





Gently pry up, but don't remove, the shakes or shingles above the repair area. Cut new pieces for the lowest course, leaving a 3/8" gap between pieces. Nail replacements in place with ring-shank siding nails. Fill in all but the top course in the repair area.





Cut the shakes or shingles for the top course. Because the top course can't be nailed, use roofing cement to fasten the pieces in place. Apply a coat of roofing cement where the shakes or shingles will sit, then slip them beneath the overlapping pieces. Press down to seat them in the roofing cement.





## Flashing, Soffits, Fascia, Gutters & Vents

**T**his section is all about controlling what gets in and what gets out around your roof. The purpose of flashing is to ensure against water infiltration, and it plays a crucial role in the integrity of any roof. Soffits and vents route air around, into, and out of the space under the roof, preventing moisture-related problems and increasing the longevity of the structure.

Along with the gutters that carry water away from the roof and house structure, and fascia that encloses rafter-end spaces to block insect infestation and control airflow, these structures all play a part in the success of a roof. You can't neglect any of them.

Fortunately, you won't need sophisticated skills to work on any of these elements in a roof. You just need to follow the rather logical processes for installing, maintaining, and—when necessary—repairing them. You'll find the basics of roof airflow and protecting against water infiltration are all common sense.

In addition to mechanically supporting the roofing itself, gutters, fascia, soffits, and vents also play an aesthetic role. Don't just opt for the cheapest or most widely available option; give some thought to the elements you choose and your entire roof will be as handsome as the rest of your home.



In this chapter:

- [Flashing](#)
- [Soffits & Vents](#)
- [Aluminum Soffits](#)
- [Aluminum Fascia](#)
- [Wood Soffits](#)
- [Repairing Wood Fascia & Soffits](#)
- [Gutters](#)





## Flashing

**F**lashing is a metal or rubber barrier used to protect the seams around roof elements or between adjoining roof surfaces. Metal flashings are made of either galvanized steel, copper, or aluminum. Whatever metal you choose, use nails made of the same material. Mixing metals can cause corrosion and discoloration.

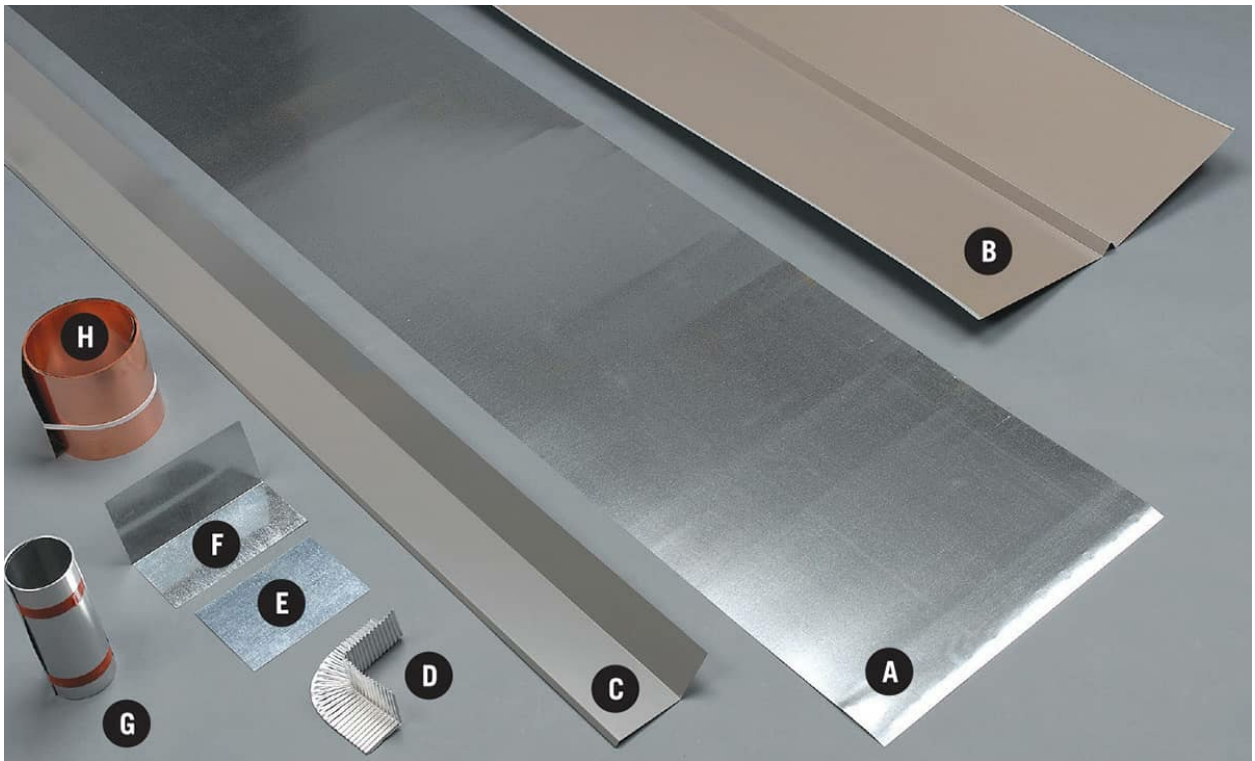
Flashing's primary job is to channel water off the roof and away from seams. It's installed in areas where shingles can't be applied and would otherwise be prone to leaks. Some flashing, such as the valley flashing shown on the opposite page, is installed over the underlayment, prior to the installation of the shingles. Other flashing, such as flashing for vent pipes, is installed in conjunction with the shingles, and is shown as part of the roofing sequences throughout this book.

While most flashing is preformed, you'll sometimes need to bend your own. This is especially true for flashing around roof elements, such as chimneys and dormers, that often need to be custom fit. Building a bending jig, as shown on the opposite page, allows you to easily bend flashing to fit your needs.

When installing flashing around roof elements, the flashing should be secured to one surface only—usually the roof deck. Use only roofing cement to bond the flashing to the roof elements. The flashing must be able to flex as the roof element and the roof deck expand and contract. If the flashing is fastened to both the roof deck and roof element, it will tear or loosen.



Flashing is a critical component of roofs that helps keep the structure watertight. Most roofs have flashing in the valleys and around dormers. This roof uses several valley flashings as well as flashing around the window and around the bump-out in the roof.



**Metal roof flashings** come in numerous profiles and shapes for specific purposes. Common flashings include: (A) roll flashing, also called handy flashing, made from galvanized metal; common widths range from 4" to 20"; (B) valley flashing (powder-coated with preformed W spine is shown); (C) drip cap molding installed above windows and doors; (D) flexible step molding for



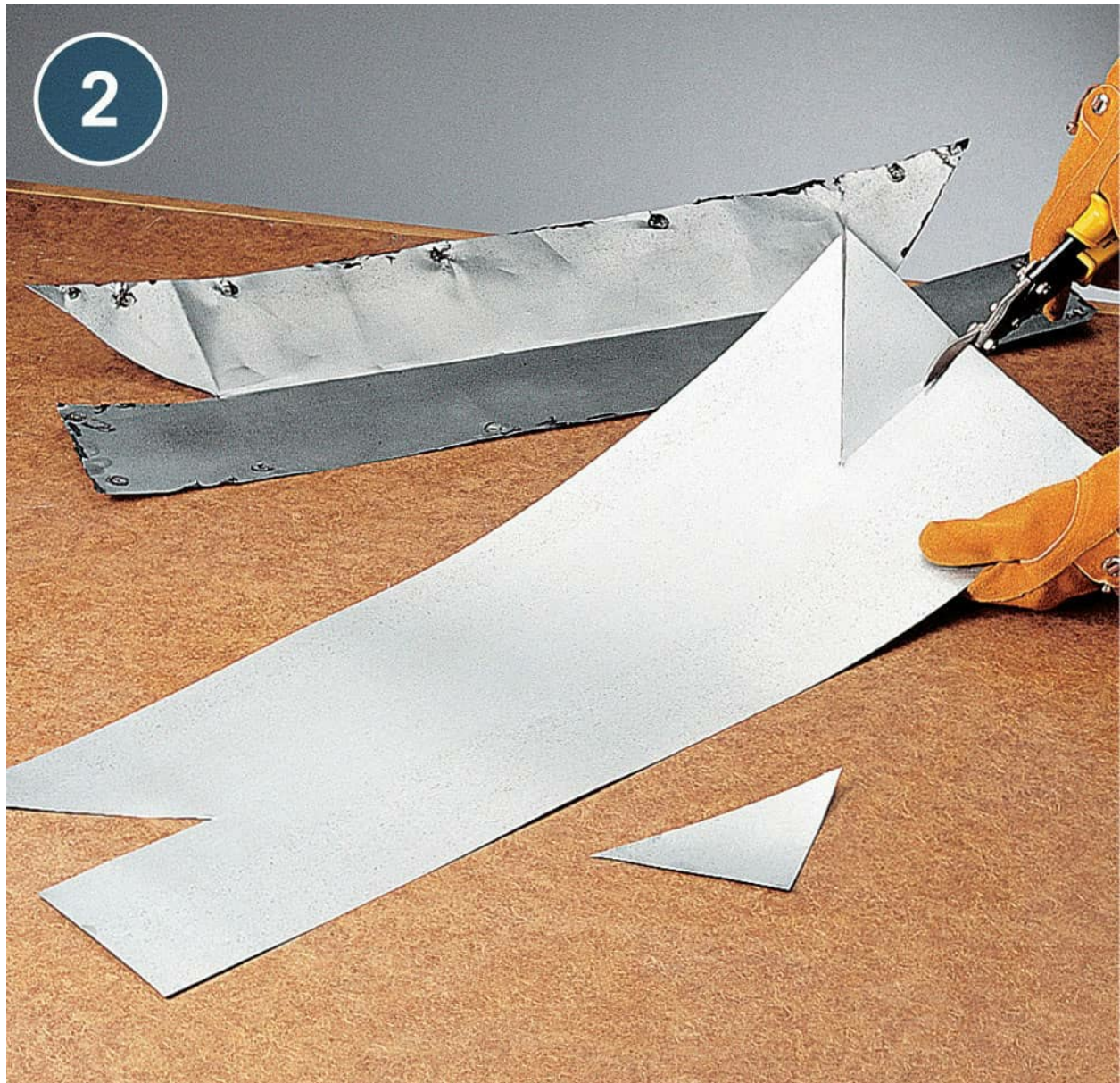
flashing around corners of vertical objects; (E) step flashing; (F) bent step flashing; (G) aluminum roll flashing; (H) copper roll flashing.

## How to Bend Flashing



To bend flashing, make a bending jig by driving screws into a piece of wood, creating a space one-half the width of the flashing when measured from the edge of the board. Clamp the bending jig to a work surface. Lay a piece of flashing flat on the board, and bend it over the edge.





Use the old flashing as a template for making replacement pieces. This is especially useful for reproducing complicated flashing, such as saddle flashing for chimneys and dormers.

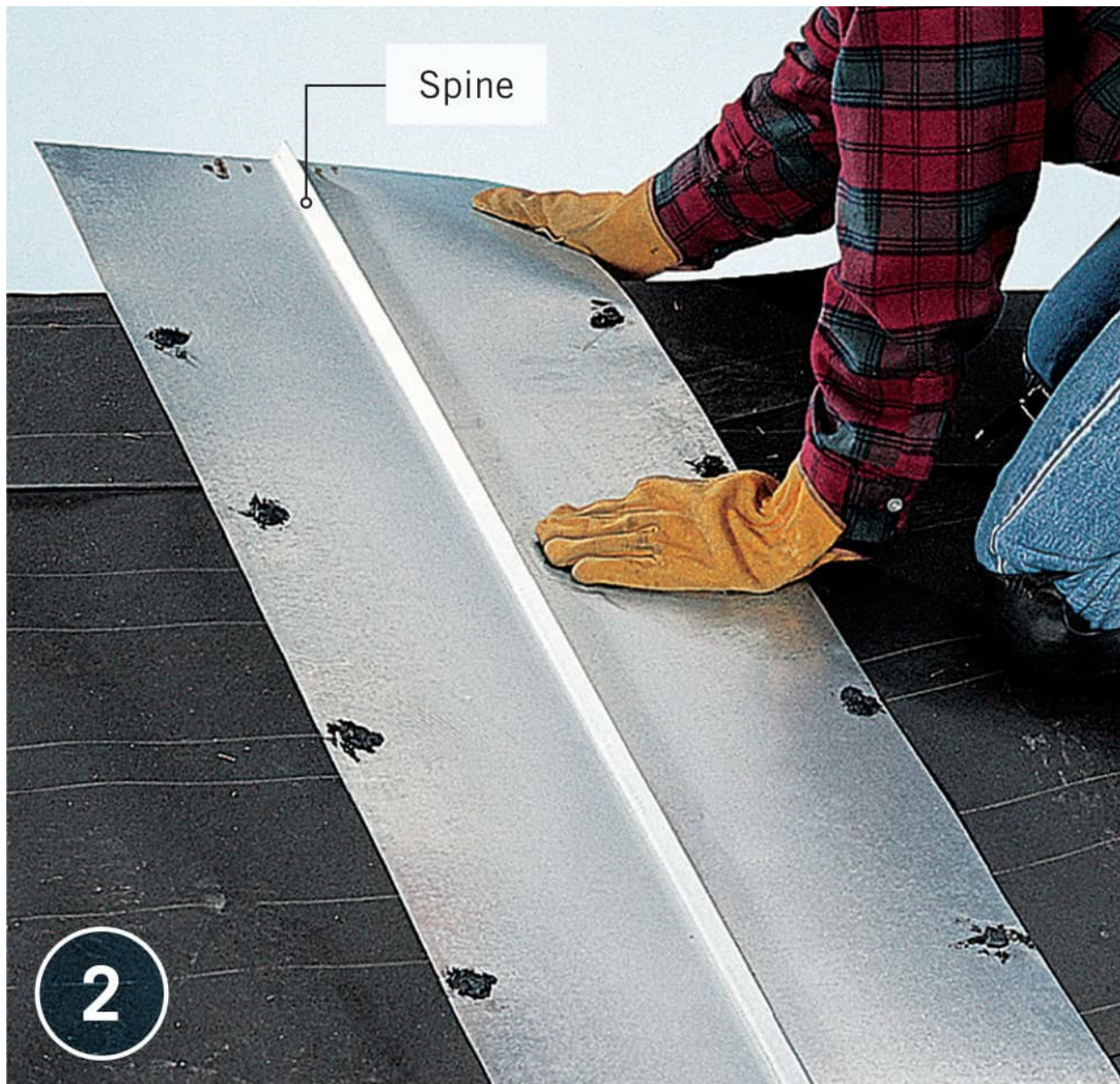


## How to Install Valley Flashing



**Starting at the eaves,** set a piece of valley flashing into the valley so the bottom of the V rests in the crease of the valley. Nail the flashing at 12" intervals along each side. Trim the end of the flashing at the eaves so it's flush with the drip edge at each side. Working toward the top of the valley, add flashing pieces so they overlap by at least 8" until you reach the ridge.





Let the top edge of the flashing extend a few inches beyond the ridge. Bend the flashing over the ridge so it lies flat on the opposite side of the roof. If you're installing preformed flashing, make a small cut in the spine for easier bending. Cover nail heads with roofing cement (unless you're using rubber gasket nails). Apply roofing cement along the side edges of the flashing.



## Soffits & Vents

An effective ventilation system equalizes temperatures on both sides of the roof, which helps keep your house cooler in the summer and prevents ice dams along the roof eaves in cold climates during the winter.

One strategy for increasing roof ventilation is to add more of the existing types of vents. Or, if you're reroofing, consider replacing all of your roof vents with a continuous ridge vent (shown [here](#)). You can increase intake ventilation by adding more soffit vents. If you're replacing your soffits with aluminum soffits, install vented soffit panels that allow air intake (shown [here](#)).

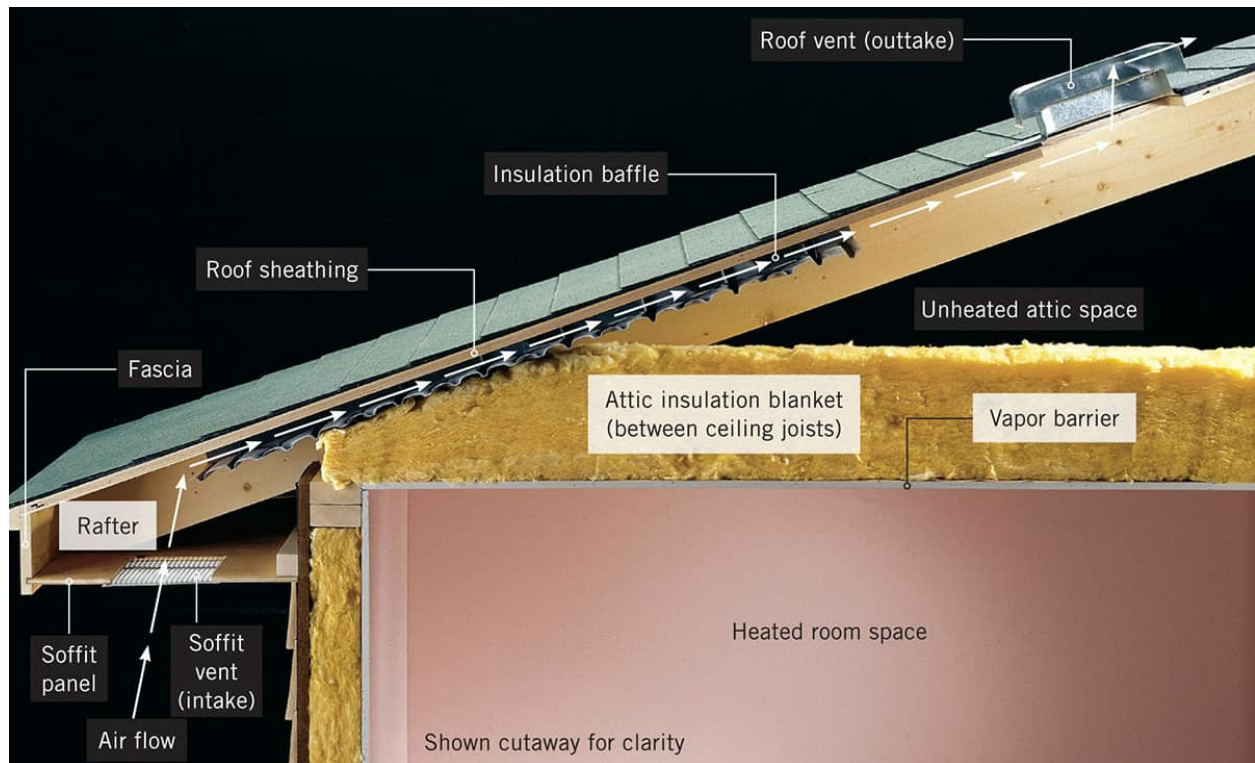




## Determining Ventilation Requirements



**Measure attic floor space** to determine how much ventilation you need. You should have 1 sq. ft. each of intake and outtake ventilation for every 300 sq. ft. of unheated attic floor space.



**Sufficient airflow** prevents heat buildup in your attic, and it helps protect your roof from damage caused by condensation or ice. A typical ventilation system has vents in the soffits to admit fresh air, which flows upward beneath the roof sheathing and exits through the roof vents.





## Types of Vents



Soffit vents can be added to increase airflow into attics on houses with a closed soffit system.



**Continuous soffit vents** provide even airflow into attics. They are usually installed during new construction, but they can be added as retrofits to unvented soffit panels.





Roof vents can be added near the ridge line when you need to increase outtake ventilation. Fixed roof vents are easy to install and have no mechanical parts that can break down.



Vented soffit panels are used with aluminum soffits to allow airflow along the eaves.





Gable and dormer vents generally are installed to increase ventilation. The vents come in a variety of styles and colors to match the siding.



**Continuous ridge vents** create an even outtake airflow because they span the entire ridge. Barely noticeable from the ground, ridge vents can be added at any time.





## Aluminum Soffits

Older soffits may be weathered or rotted and may not allow adequate airflow. If more than 15 percent of your soffits need to be repaired, your best option is to replace them. This project shows how to completely remove the old soffits and fascia and install aluminum soffits, which are maintenance free. If your old subfascia is in good condition, it will not need to be replaced.

The project starting on the opposite page details the installation of soffits on an eaves system that has rafter lookouts. The soffits are installed directly beneath these lookouts. If your eaves do not have rafter lookouts, follow the instructions starting shown [here](#). This project also shows how to install soffits around corners.

For both eaves systems, an F-channel serves as a mounting channel to hold the soffits in place along the house. You can also install the channel along the subfascia, as shown in step 4 shown [here](#), or you can nail the soffits directly to the subfascia, as shown in step 4 shown [here](#). Drive nail heads flush with the surface. Driving the nails too deep can knock the soffits out of shape and prevent movement. Since the soffits will receive additional nailing when the fascia is installed, you don't need to drive a nail in every V-groove in the soffits.

To cut soffits, use a circular saw with a fine-tooth blade installed backward. Don't cut all of your panels at the start of the job because the width will probably change slightly as you move across the house.

Use vented soffit panels to work in conjunction with roof or attic vents. This improves airflow underneath the roof, which prevents moisture damage and ice dams. Provide 1 square foot of soffit vents for every 150 square feet of unheated attic space. For a

consistent appearance, make sure all of the fins on the soffit vents are pointed in the same direction.



## TOOLS & MATERIALS

Flat pry bar

Hammer

Circular saw with fine-tooth metal blade (installed backward)

Drill

Tape measure

Aviation snips

Level

Framing square

Soffit panels

T-channel

F-channel (mounting channel)

1¼" aluminum trim nails

16d common nails

Nailing strips

Drip edge

2¼" deck screws

8d box nails

Subfascia, if needed (2 × 4, 1 × 8, or 2 × 8)

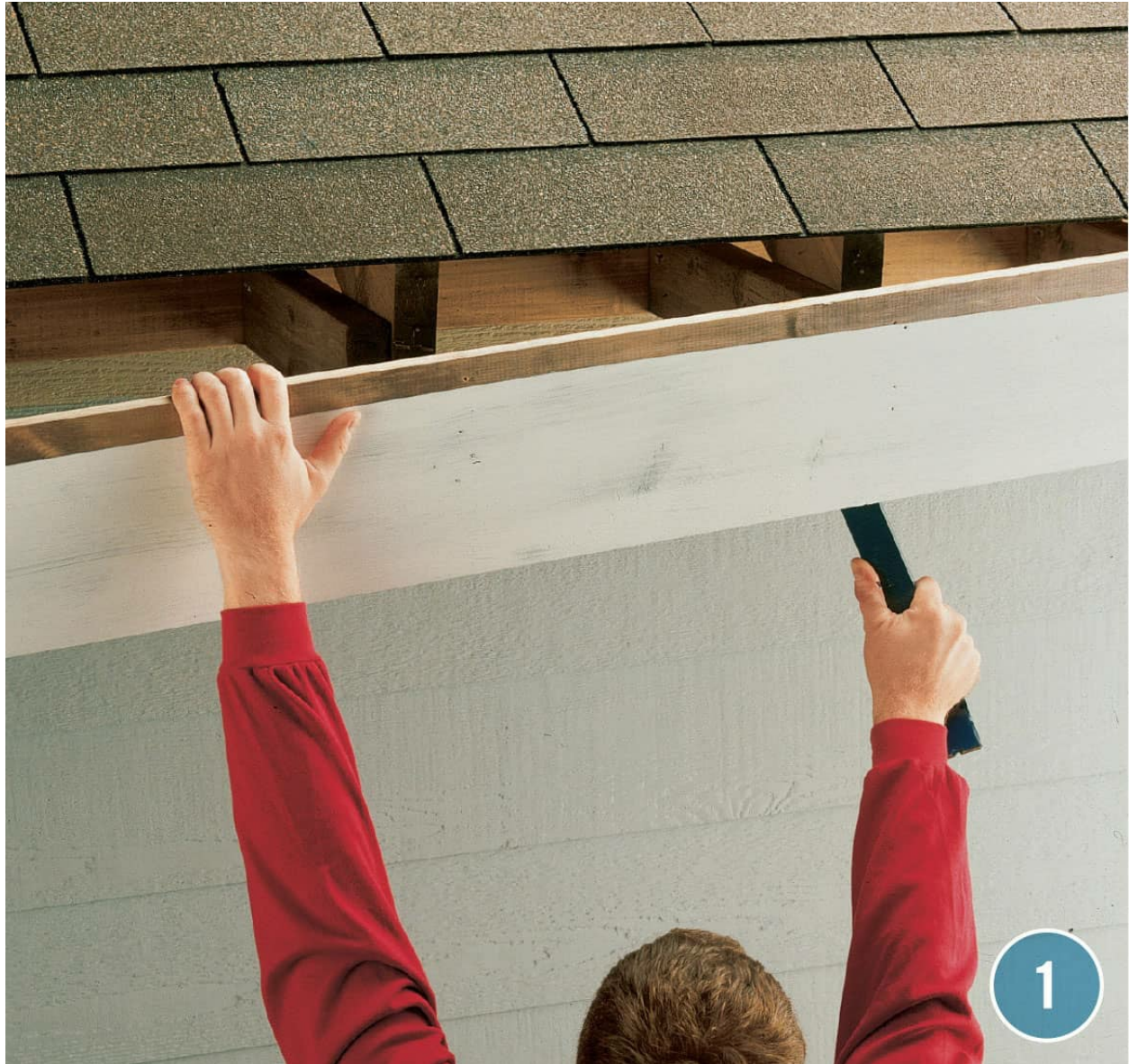




**Install a new soffit system** if your old system has failed, or if pests have infested the open eaves areas of your roof overhang. A complete soffit system consists of fabricated fascia covers, soffit panels (nonventilated or ventilated), and support channels that hold the panels at the sides of your house. Most soffit systems sold at building centers are made of aluminum.



## How to Install Aluminum Soffits (with Rafter Lookouts)



Remove trim, soffits, and fascia along the eaves using a flat pry bar. If the eaves contain debris, such as bird nests or rotted wood, clean them out.





Check the rafters and rafter lookouts for decay or damage. Repair or replace them as needed.

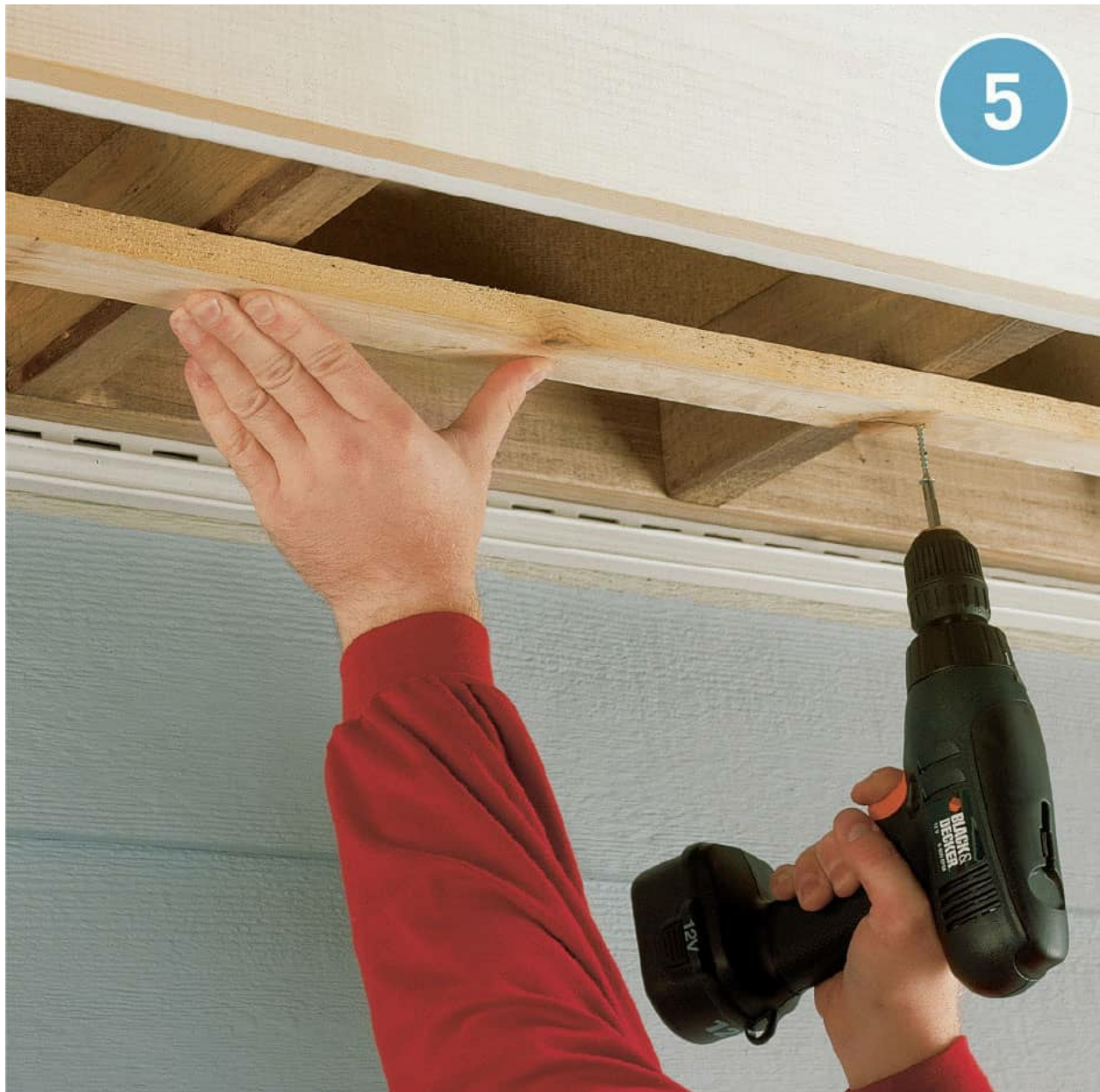


Install new 1 × 8 or 2 × 8 subfascia over the rafters and rafter lookouts using 16d nails. Butt subfascia boards together at rafter or rafter lookout locations. Install drip edge at the top of the subfascia. Leave a  $\frac{1}{16}$ " gap between the drip edge and the subfascia for the fascia to fit.





Install F-channels for the soffit panels along the bottom inside edge of the subfascia and along the outside wall of the house directly below the rafter lookouts. If more than one piece of channel is needed, butt pieces together.



If the soffit panels will span more than 16", or if your house is subjected to high winds, add nailing strips to provide additional support.





**Measure the distance between the mounting channels, subtract  $\frac{1}{8}$ ", and cut soffits to size. Slide the soffit panels in place, fitting the ends inside the mounting channels. Nail the panels to the nailing strips, if you've installed them.**



Install soffit panels in the remaining spaces, cutting them to fit as needed. When finished, install the fascia (shown [here](#)).

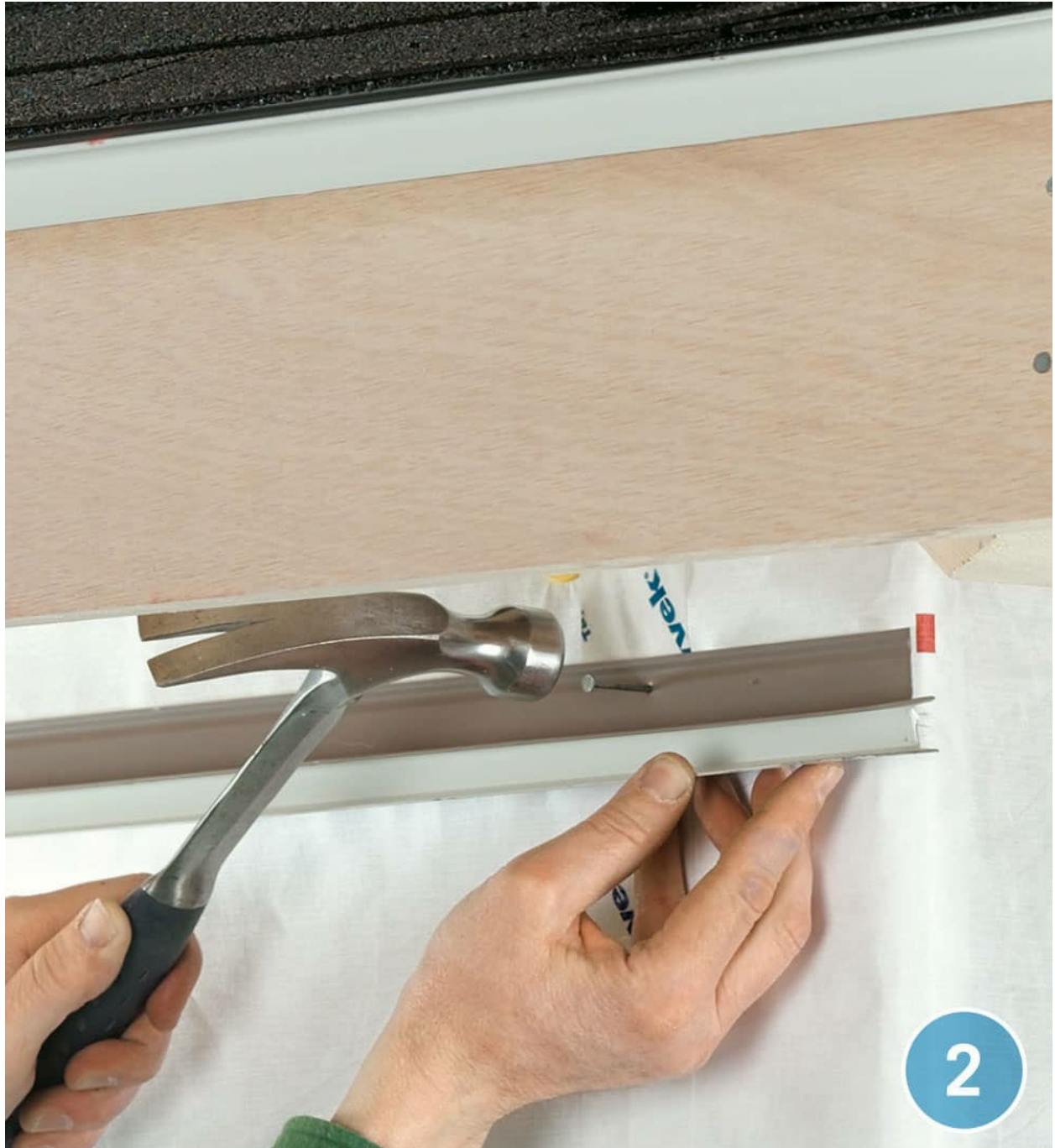


## How to Install Aluminum Soffits (without Rafter Lookouts)



Remove the old soffits and fascia, following step 1 shown [here](#). Place a level at the bottom of the subfascia board, level across to the house, and make a

mark. Measure down from the mark a distance equal to the thickness of the soffits (usually about  $\frac{1}{4}$ "). Do this on each end of the wall. Snap a chalkline between the lower marks.



Start the F-channel at a corner and align the bottom edge with the chalkline. Nail the channel to the wall at stud locations using 8d box nails. If more than one F-channel is needed, butt the pieces together.





**At corners,** cut a 2 × 4 to fit between the house and the inside corner of the subfascia to provide support for the T-channel. Notch the 2 × 4 as needed, then nail in place so when the T-channel is installed, it will be aligned with the F-channel. Cut the T-channel to fit. Place it against the 2 × 4, setting the back edge inside the F-channel, and nail in place.



Measure between the F-channel and the outside edge of the subfascia. Subtract  $\frac{1}{4}$ ", and cut the soffits to size. For corners, miter the panels to fit the T-channel. Install the first panel inside the channel. Make sure the panel is square to the subfascia using a framing square. Nail the panel to the subfascia at the V-grooves. Slide the next panel against the first, locking them together. Nail the panel in place. Install remaining panels the same way.





## Variations for Installing Aluminum Soffits

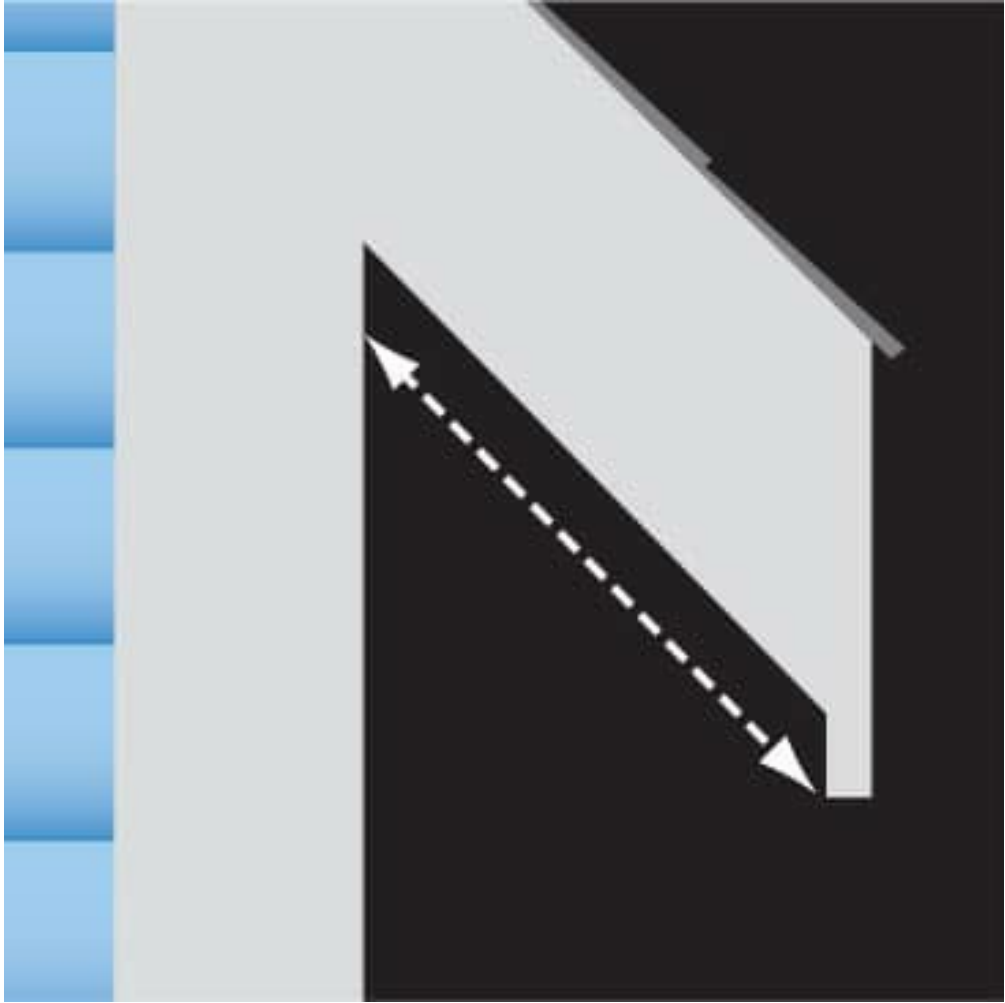


**Straight corners** are made by installing the T-channel parallel with one of the F-channels. Align the outside edge of the T-channel with the outside edge of the installed F-channel. Keep the T-channel back  $\frac{1}{4}$ " from the outside of the subfascia, and nail it in place. Install the soffits in the channels.



**Inclined overhangs** allow soffits to run the same angle as the rafters. At the end of the rafter overhangs, measure from the bottom of the rafter to the bottom of the subfascia. Add the thickness of the soffits, then measure down from the rafters along the wall and make a mark at this distance. Do this on each end of the wall. Snap a chalkline between the marks. Align the bottom of the F-channel with the chalkline, nail the channel to the wall, then install the soffits.







## Aluminum Fascia

Fascia fits under the drip edge and against the subfascia to provide a smooth transition from the roof to the eaves. You may need to temporarily remove any nails in the face of the drip edge so the fascia can slide in behind it. If your roof does not have drip edge, install a finish trim, such as undersill, at the top of the subfascia to receive the fascia.

If you're also replacing your gutters, take down the gutters first, then install the fascia. If you don't want to remove the gutters, you can slip the fascia behind them while they're in place.

Fascia is nailed along the lip covering the soffits, and the top is held in place by the drip edge, so it doesn't require any face nailing.





The fascia is installed over the subfascia to cover the exposed edges of the soffits and enhance the appearance of your home. The fascia is usually the same color and material as your soffits.



## TOOLS & MATERIALS

Hammer

Aviation snips

Tape measure

Chalkline

Fascia

Aluminum trim nails

# How to Install Aluminum Fascia



**Remove the old fascia, if necessary.** Measure from the top of the drip edge to the bottom of the soffits, and subtract  $\frac{1}{4}$ ". Cut the fascia to this measurement by snapping a chalkline across the face and cutting with aviation snips. (This cut edge will be covered by the drip edge.)

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**TIP:** If your old fascia is wood and still in good shape, you can install aluminum fascia over it without removing it.





**Slide the cut edge of the fascia behind the drip edge.** Place the bottom lip over the soffits. Make sure the fascia is tight against the soffits and against the subfascia, then nail through the lip into the subfascia. Nail approximately every 16" at a V-groove location in the soffits.



To overlap fascia panels, cut the ridge on the lip of the first panel 1" from the end using aviation snips. Place the second panel over the first, overlapping the seam by 1". Nail the fascia in place.





**At outside corners,** cut the lip and top edge of the first panel 1" from the end. Place a piece of wood 1" from the end, and bend the panel to form a 90° angle. Install the panel at the corner. Cut a 45° angle in the lip of the second panel. Align the end of this panel with the corner, overlapping the first panel.



For inside corners, cut and bend the first panel back 1" from the end to make a tab. Install the panel. On the second panel, cut a 45° angle in the lip. Slide the panel over the first panel, butting the end against the adjacent fascia. Nail the panel in place.





Install soffit panels to close off the area between the fascia cover and the exterior wall (see [here](#)).



## Wood Soffits

Wood soffits are typically used on houses with wood or fiber-cement siding and are painted the same color as the trim. To see how the soffits fit in relation to the fascia and rafters, refer to the photo shown [here](#). You can use plywood or engineered wood for the soffits. Engineered wood has the advantage of being treated to resist termites and fungus, and it's more resistant to warping and shrinking. Plywood has the advantage of being less expensive. If your soffits are more than 24 inches wide, install a nailing strip between panels to hold the seams tightly together.

When replacing soffits, you may need to remove the top course of siding and any trim pieces under the old soffits before starting the new installation. Remove the pieces carefully, then reinstall them once the soffit job is finished.



### TOOLS & MATERIALS

- Hammer
- Circular saw
- Level
- Chalkline
- Caulk gun
- Paintbrush
- Drill
- Jigsaw
- 3/8" plywood 16d box nails
- 6d corrosion-resistant nails



2 × 2 lumber

Acrylic latex caulk

Vents

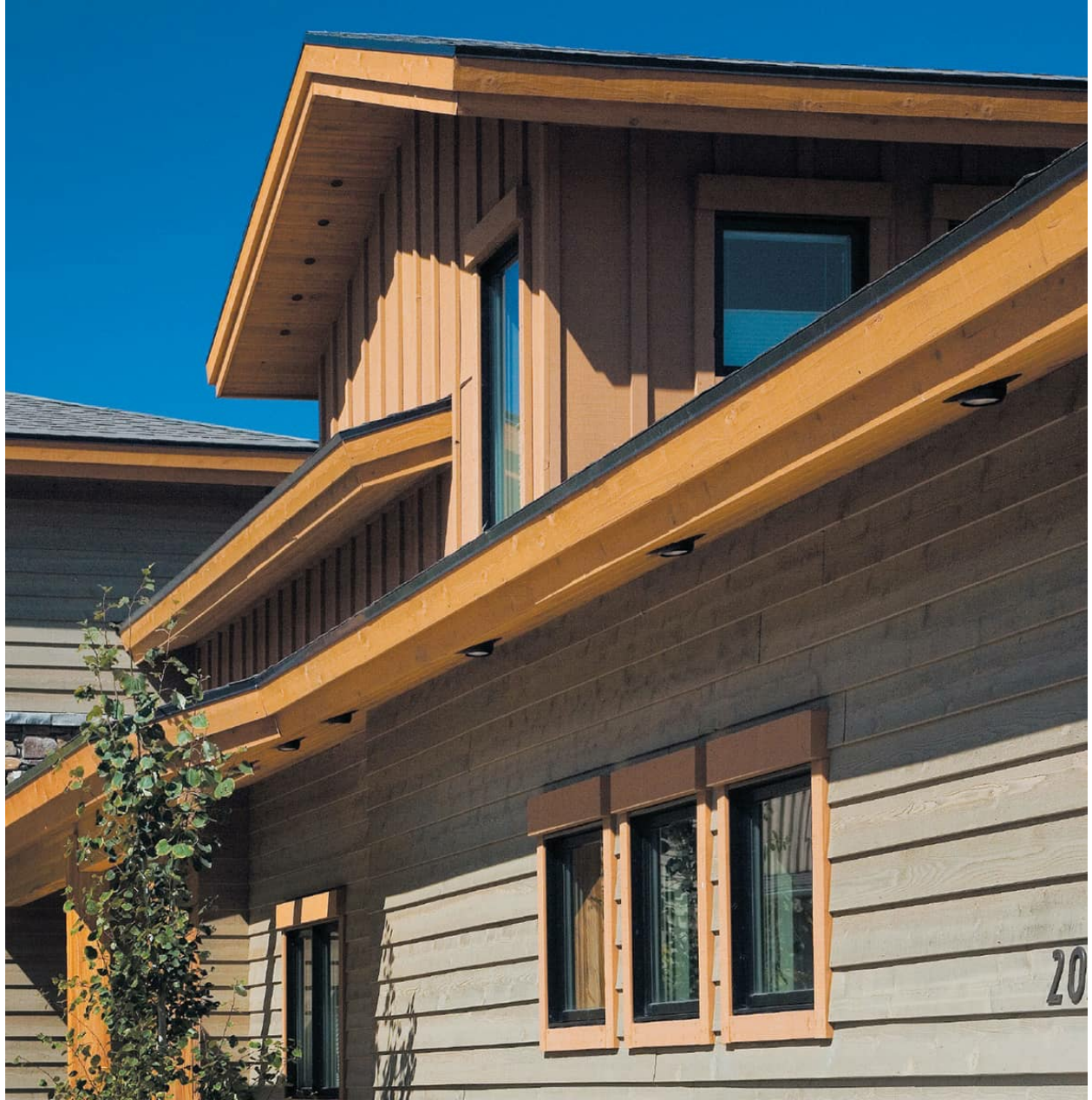
Primer

Paint



Wood soffits cover the eaves area between the fascia and siding. Painted soffit moldings beneath the soffits give the house a finished look. Soffit vents installed at regular intervals play a vital role in the home's ventilation system.



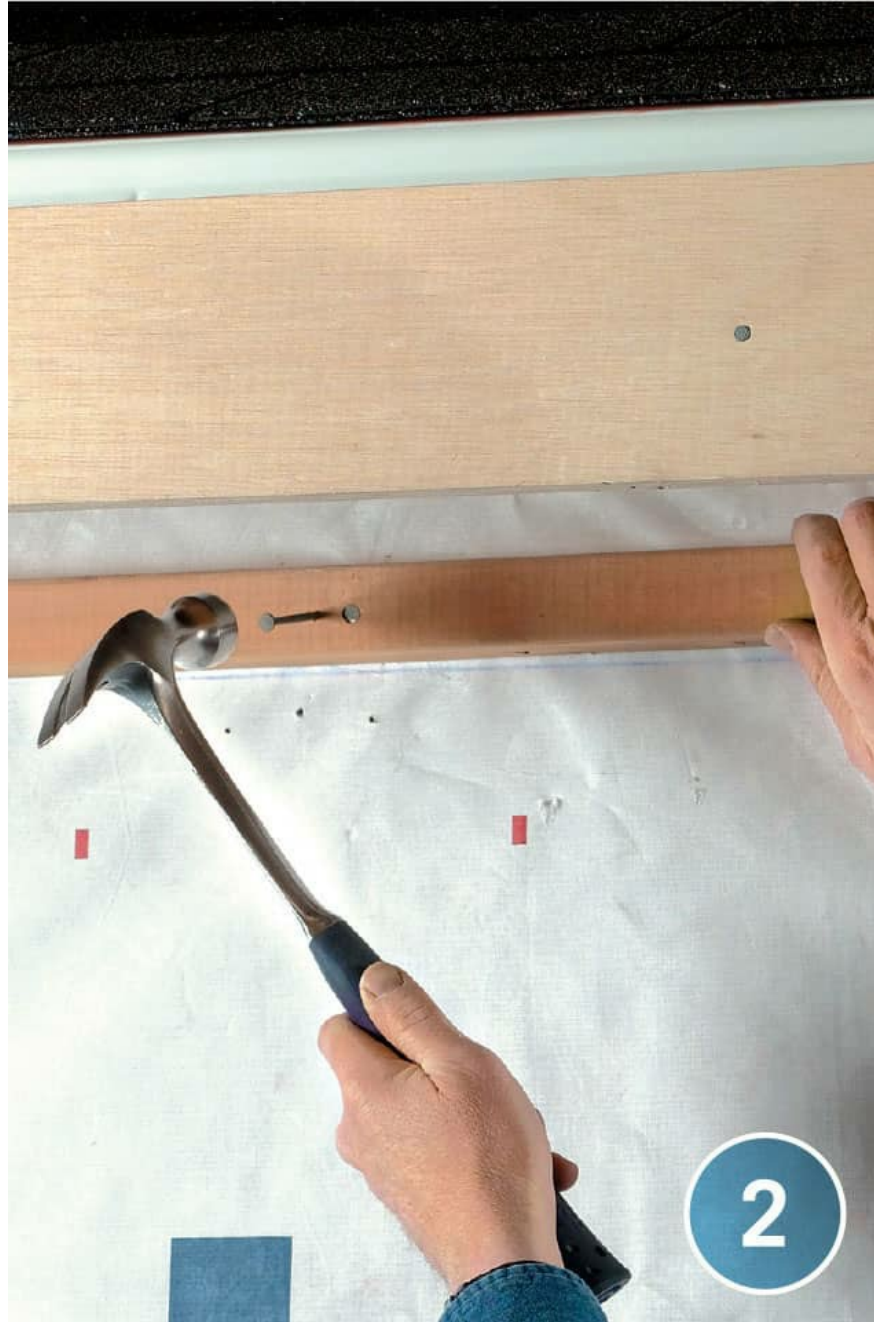


## How to Install Wood Soffits



Hold a level against the bottom edge of the subfascia to make a mark on the wall. Do this on both ends of the wall, then snap a chalkline between the marks.





Align the bottom edge of 2 × 2 lumber with the chalkline. Nail the lumber to wall studs using 16d nails.



**Measure the distance** from the wall to the outside of the subfascia, subtract  $\frac{1}{4}$ ", and rip the soffits to this width. Apply primer to the soffits. If using wood that's already primed, apply primer to the cut edges only.





Place the soffit against the 2 × 2 and subfascia, staying  $\frac{1}{8}$ " from the edges. Nail in place using 6d nails. Install remaining soffits, keeping a  $\frac{1}{8}$ " gap between panels. Caulk the gaps between soffits and between the soffits and wall. Paint soffits as desired. Let the paint dry.



Mark the vent locations in the soffits by holding the vent in place and tracing around it. Drill starter holes at opposite corners of the outline, then cut out the opening with a jigsaw. Install the vent using the fasteners that came with it. Do this at each vent location.





**VARIATION:** If the soffits have rafter lookouts, you don't need to install 2 × 2s. Instead, nail the soffits directly to the rafter headers and lookouts. Make sure soffit seams fall midway across rafter lookouts.

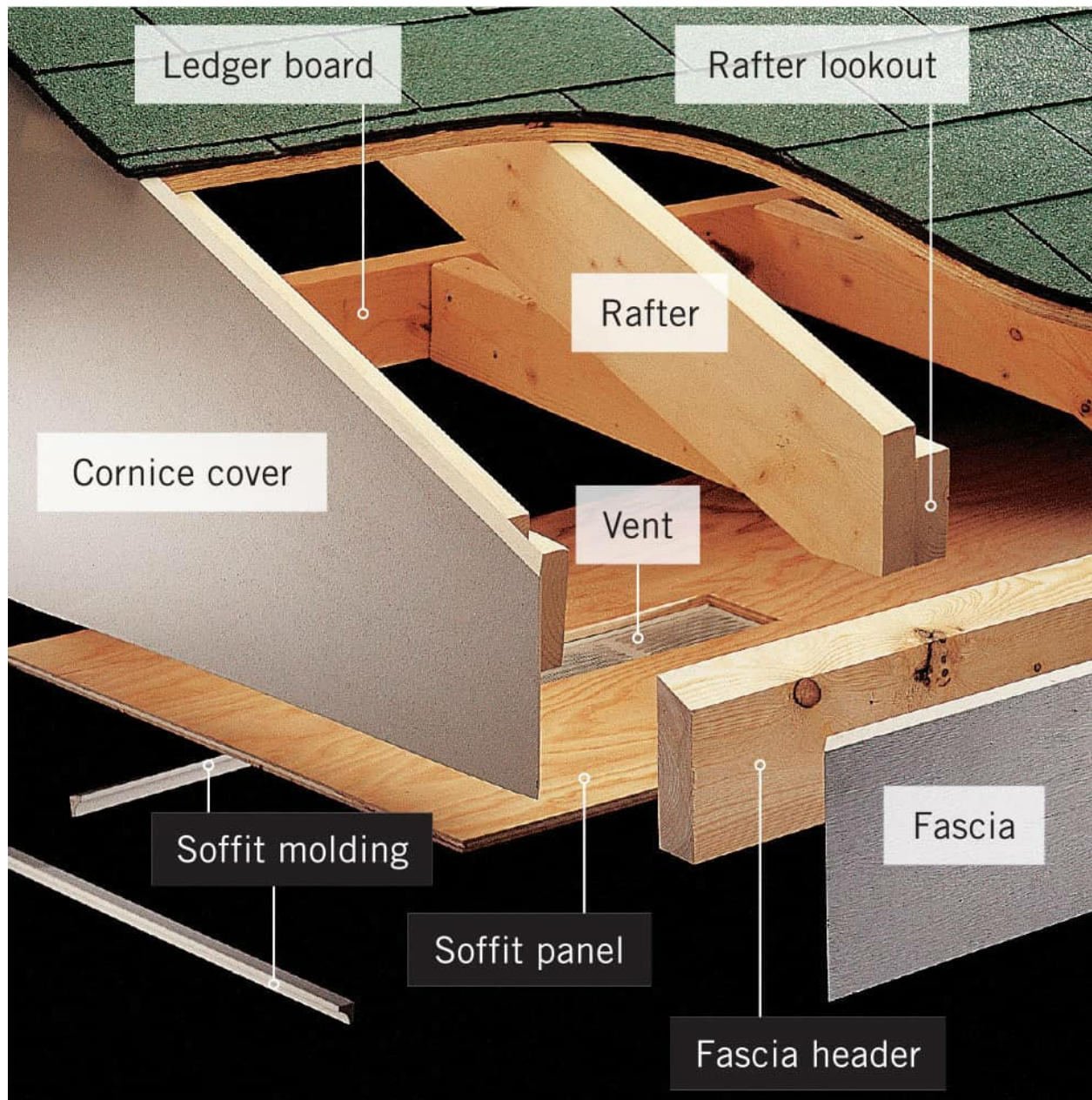


## Repairing Wood Fascia & Soffits

Fascia and soffits add a finished look to your roof and promote a healthy roof system. A well-ventilated soffit system prevents moisture from building up under the roof and in the attic.

Most fascia and soffit problems can be corrected by cutting out sections of damaged material and replacing them. Joints between fascia boards are lock nailed at rafter locations, so you should remove whole sections of fascia to make accurate bevel cuts for patches. Soffits can often be left in place for repairs.





Fascia and soffits close off the eaves area beneath the roof overhang. The fascia covers the ends of rafters and rafter lookouts and provides a surface for attaching gutters. Soffits are protective panels that span the area between the fascia and the side of the house.



## TOOLS & MATERIALS

Circular saw

Jigsaw

Drill

Putty knife

Hammer

Flat pry bar

Nail set

Chisel

Caulk gun

Paintbrush

Replacement materials

Nailing strips

Primer

Paint

Acrylic caulk

Galvanized deck screws (2", 2½")

4d galvanized casing nails



## How to Repair Wood Fascia



Remove gutters, shingle moldings, and any other items mounted on the fascia. Carefully pry off the damaged fascia board using a pry bar. Remove the entire board and all old nails.

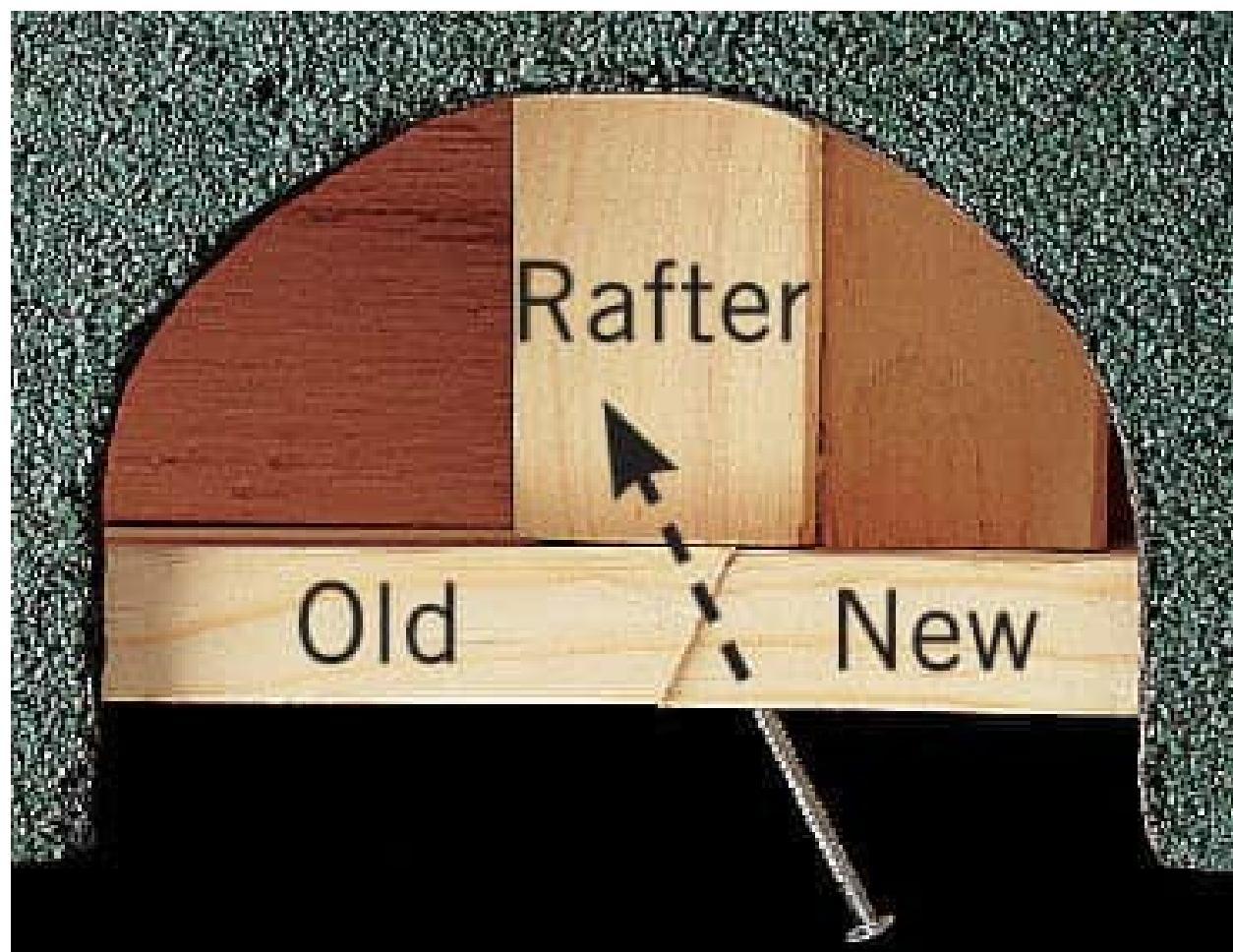


Set your circular saw for a 45° bevel, and cut off the damaged portion of the fascia board. Reattach the undamaged original fascia to the rafters or rafter lookouts using 2" deck screws. Bevel-cut a patch board to replace the damaged section.





**Set the patch board in place.** Drill pilot holes through both fascia boards into the rafter. Drive nails in the holes to create a locknail joint (inset). Replace shingle moldings and trim pieces using 4d casing nails. Set the nail heads. Prime and paint the new board.





# How to Repair Wood Panel Soffits



**In the area where soffits are damaged,** remove the support moldings that hold the soffits in place along the fascia and exterior wall. Drill entry holes, then use a jigsaw to cut out the damaged soffit area.

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**TIP:** Cut soffits as close as possible to the rafters or rafter lookouts. Finish cuts with an oscillating tool or a chisel, if necessary.



Remove the damaged soffit section using a pry bar. Cut nailing strips the same length as the exposed area of the rafters, and fasten them to the rafters or rafter lookouts at the edges of the openings using  $2\frac{1}{2}$ ' deck screws.





Using soffit material similar to the original panel, cut a replacement piece  $\frac{1}{8}$ " smaller than the opening. If the new panel will be vented, cut the vent openings.



Attach the replacement panel to the nailing strips using 2" deck screws. If you are not going to paint the entire soffit after the repair, prime and paint the replacement piece before installing it.



Reattach the soffit molding using 4d casing nails. Set the nail heads.





Using **siliconized acrylic caulk**, fill all nail holes, screw holes, and gaps. Smooth out the caulk with a putty knife until the caulk is even with the surface. Prime and paint the soffit panels.



# Gutters



## TOOLS & MATERIALS

Chalkline

Tape measure

Drill

Hacksaw

1¼" deck screws

Gutters

Drain pipes

Connectors

Fittings

Hangers

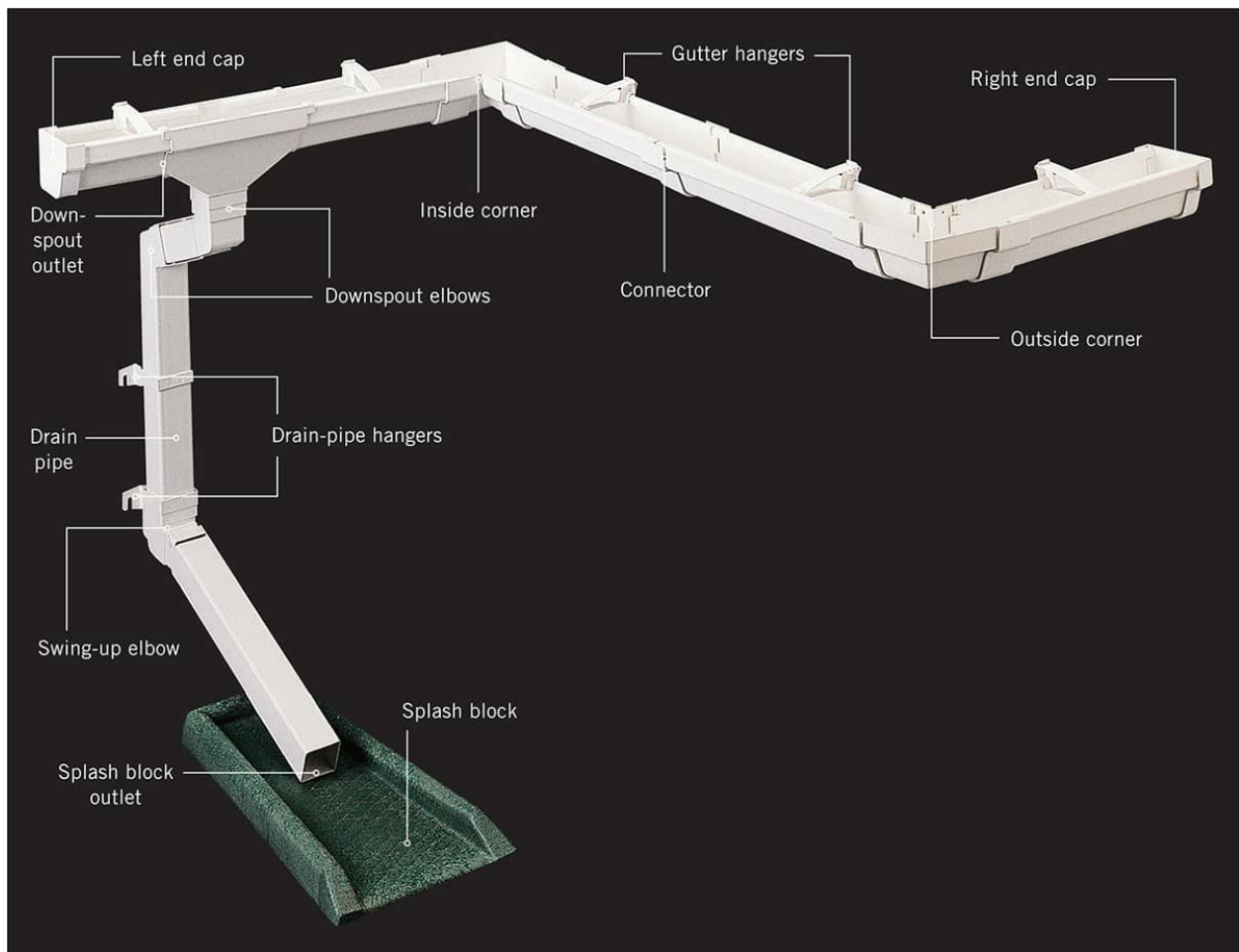




## Vinyl Gutters

Installing a snap-together vinyl gutter system is a manageable task for most do-it-yourselfers. Snap-together gutter systems are designed for ease of installation, requiring no fasteners other than the screws used to attach the gutter hangers to the fascia.

Before you purchase new gutters, create a detailed plan and cost estimate. Include all of the necessary parts, not just the gutter and drain pipe sections—they make up only part of the total system. Test-fit the pieces on the ground before you begin the actual installation.



**Vinyl snap-together gutter systems** are easy to install and relatively inexpensive, and they won't rot or deteriorate. The slip joints allow for expansion and contraction, which contribute to their reliability and longevity.

### **Estimating Gutter Parts**

- Gutter sections: Measure total length of run; add 15% for waste. Sold in 10' lengths.
- Gutter hangers: One for every 2' of gutter.
- Inside/outside corners: One per corner with no outlet.
- Connectors: Two per corner; one per 10' of gutter.
- End caps (right or left): One per end.
- Downspout outlets: One for every 35' of gutter.
- Downspout elbows: Three per downspout.
- Drainpipe: One pipe per downspout outlet. Measure gutter height and add 5' for each pipe (for splash block outlet and waste).



# How to Install Vinyl Gutters



Mark a point at the high end of each gutter run, 1" from the top of the fascia. Snap chalklines that slope  $\frac{1}{4}$ " per 10' toward downspouts. For runs longer than 35', mark a slope from a high point in the center toward downspouts at each end.





Install downspout outlets near the ends of gutter runs (at least one outlet for every 35' of run). The tops of the outlets should be flush with the slope line, and they should align with end caps on the corners of the house.





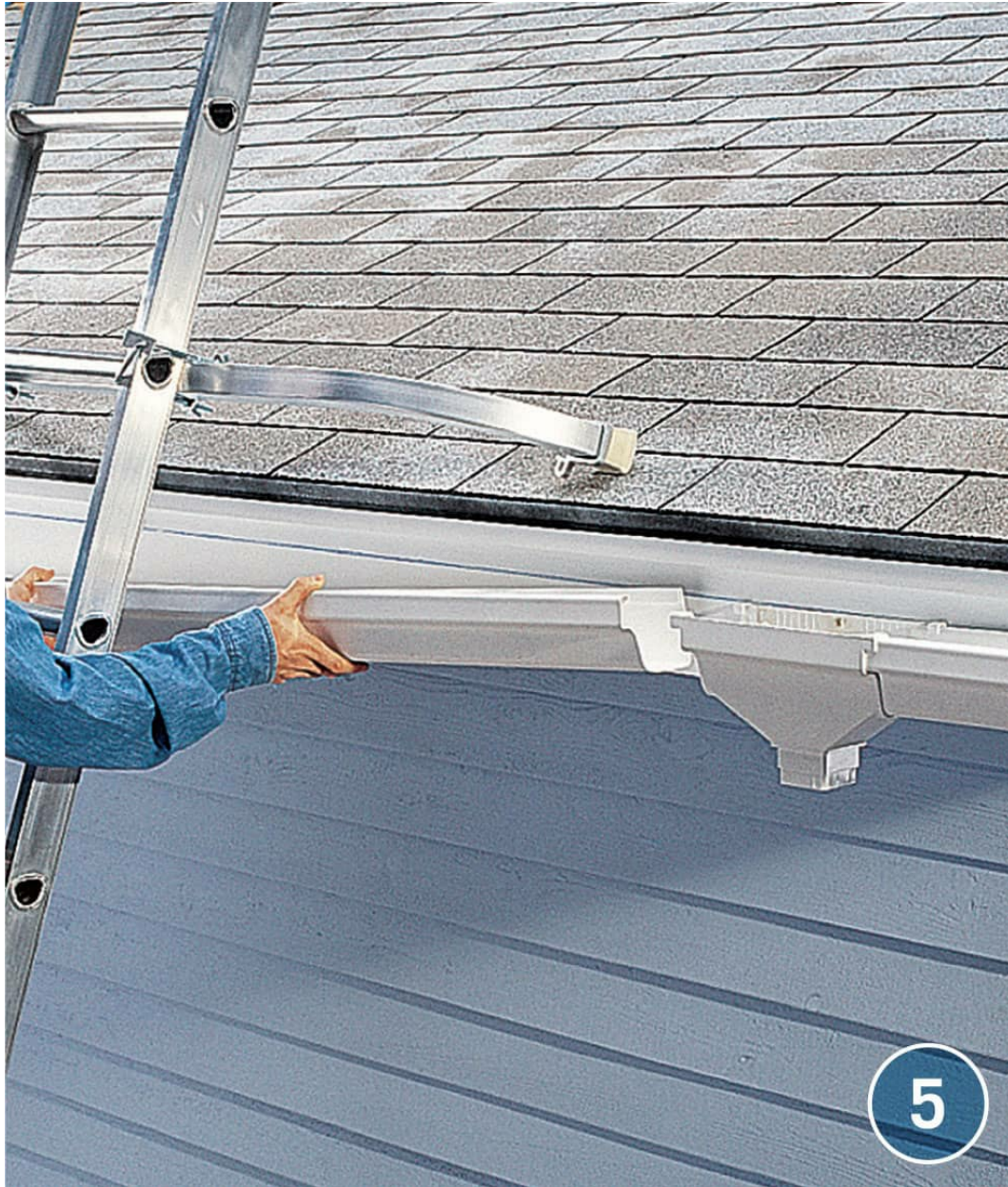
Following the slope line, attach hangers or support clips for hangers for a complete run. Attach them to the fascia at 24" intervals using deck screws.





Following the slope line, attach outside and inside corners at all corner locations that don't have end caps.





Use a hacksaw to cut gutter sections to fit between outlets and corners. Attach the end caps and connect the gutter sections to the outlets. Cut and test-fit gutter sections to fit between outlets, allowing for expansion gaps.





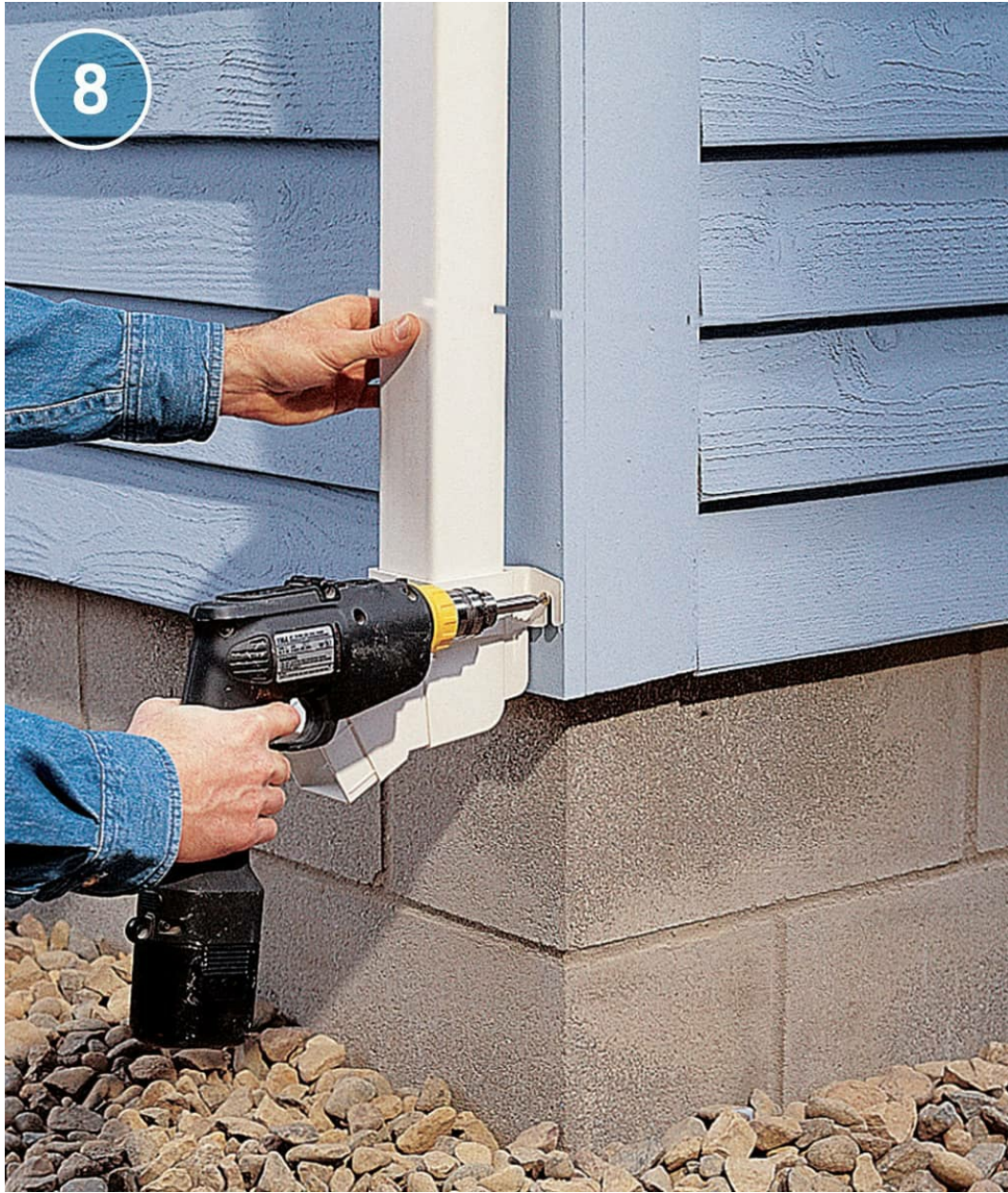
Working on the ground, join the gutter sections together using connectors. Attach gutter hangers to the gutter (for models with support clips mounted on the fascia). Hang the gutters, connecting them to the outlets.





**Cut a section of drainpipe to fit between two downspout elbows. One elbow should fit over the tail of the downspout outlet and the other should fit against the wall. Assemble the parts, slip the top elbow onto the outlet, and secure the other to the siding with a drainpipe hanger.**





Cut a piece of drainpipe to fit between the elbow at the top of the wall and the end of the drainpipe run, staying at least 12" above the ground. Attach an elbow, and secure the pipe to the wall with a drainpipe hanger. Add accessories, such as splash blocks, to help channel water away from the house (inset).







## Metal Gutters

Most home centers carry sections of aluminum or galvanized steel gutter along with the components necessary to install your own system. Gutter sections and downspouts are typically 10 feet long, though if you order them online and have them shipped to your home they'll arrive in 5-foot sections. Assembly is easy. Pieces go together with self-tapping screws and sealant, though pop-rivets also prove handy.

Installation is the hard part. You'll be working at heights with long components. While up there you'll need to attach the gutter so it smoothly inclines toward the downspout at a slope of  $\frac{1}{4}$  inch for every 10 feet. Enlist a helper for installation or rig up a loop of rope to hold one end of the gutter while you attach the hangers to the fascia. Typically, you can use your old gutter setup as a guide for the new.

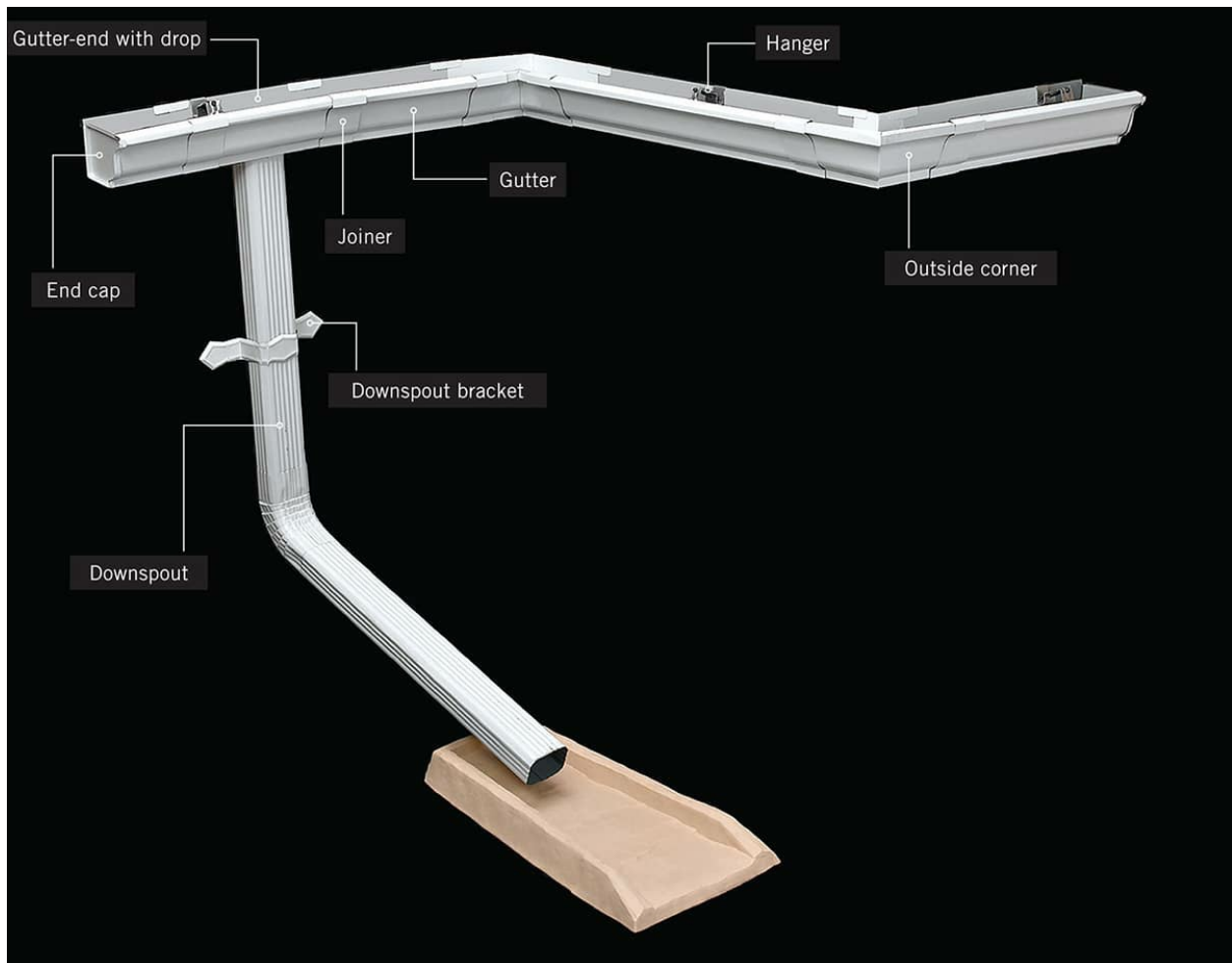


### TOOLS & MATERIALS

- Tape measure
- Drill with  $\frac{1}{4}$ " hex-drive bit
- Caulk gun
- Chalkline
- Hammer
- Tin snips
- Hacksaw
- Gutters
- Zip screws
- Hangers



Gutter sealant or  
silicone caulk  
Gutter outlets  
Downspouts  
End caps  
Elbows  
Downspout brackets  
End box  
Speed square



Sealed and fastened correctly, gutters made of components available at your home center will function as well as seamless gutters fabricated on site by a

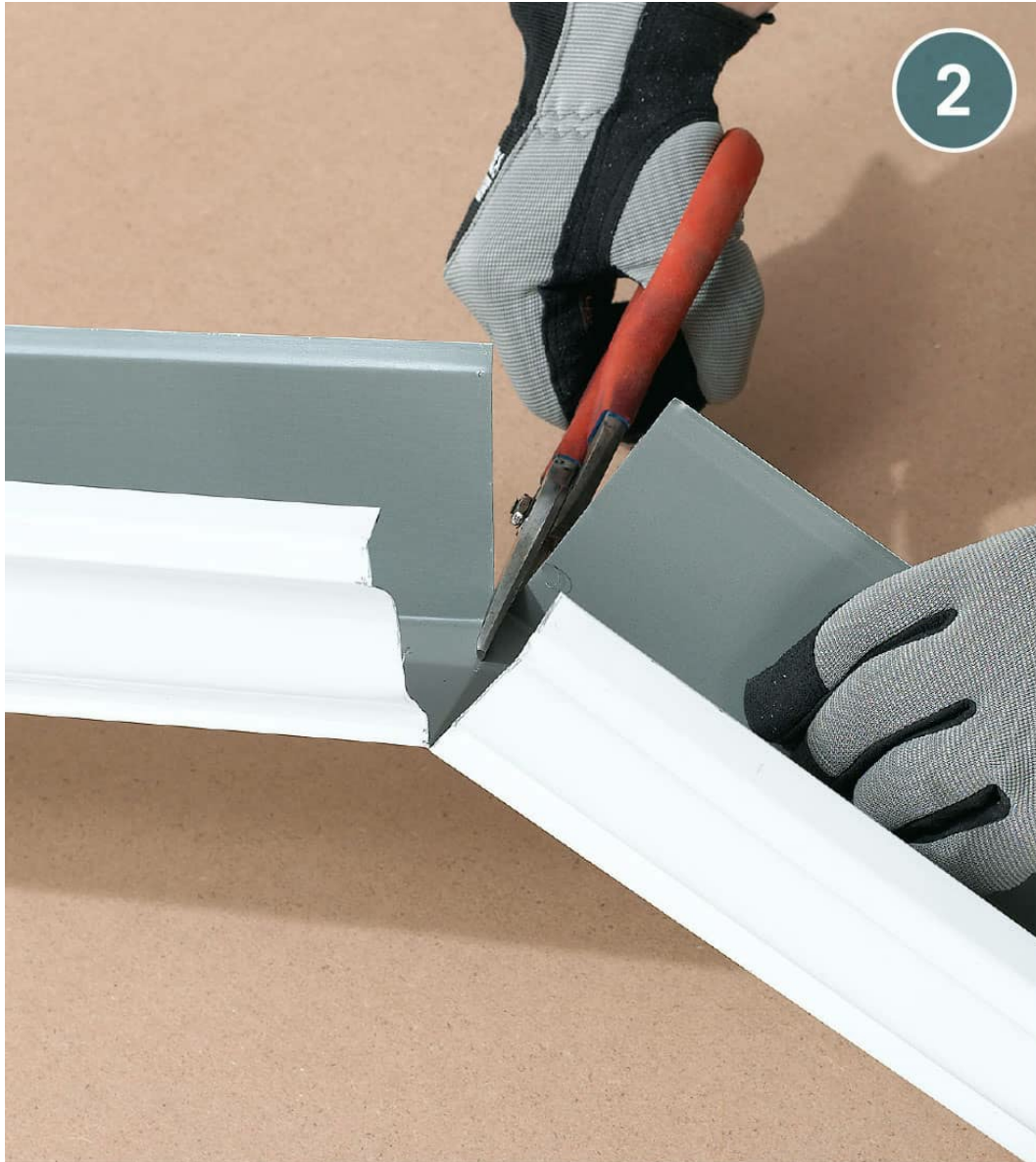
contractor. The trick is getting the slope smooth and accurate.



# How to Install Metal Gutters



**At the fascia's midpoint, measure down from the drip edge and make a mark for the bottom of the gutter. Mark both ends of the fascia, adding a  $\frac{1}{4}$ " slope for every 10' of gutter. Snap chalklines between the marks.**



Use tin snips to cut the gutter in three steps. After marking all three sides, nip through the top front edge of the gutter, and then work down through the profile. Next, cut the back of the gutter. Finally, let the gutter bend open as shown so you can cut through the bottom.



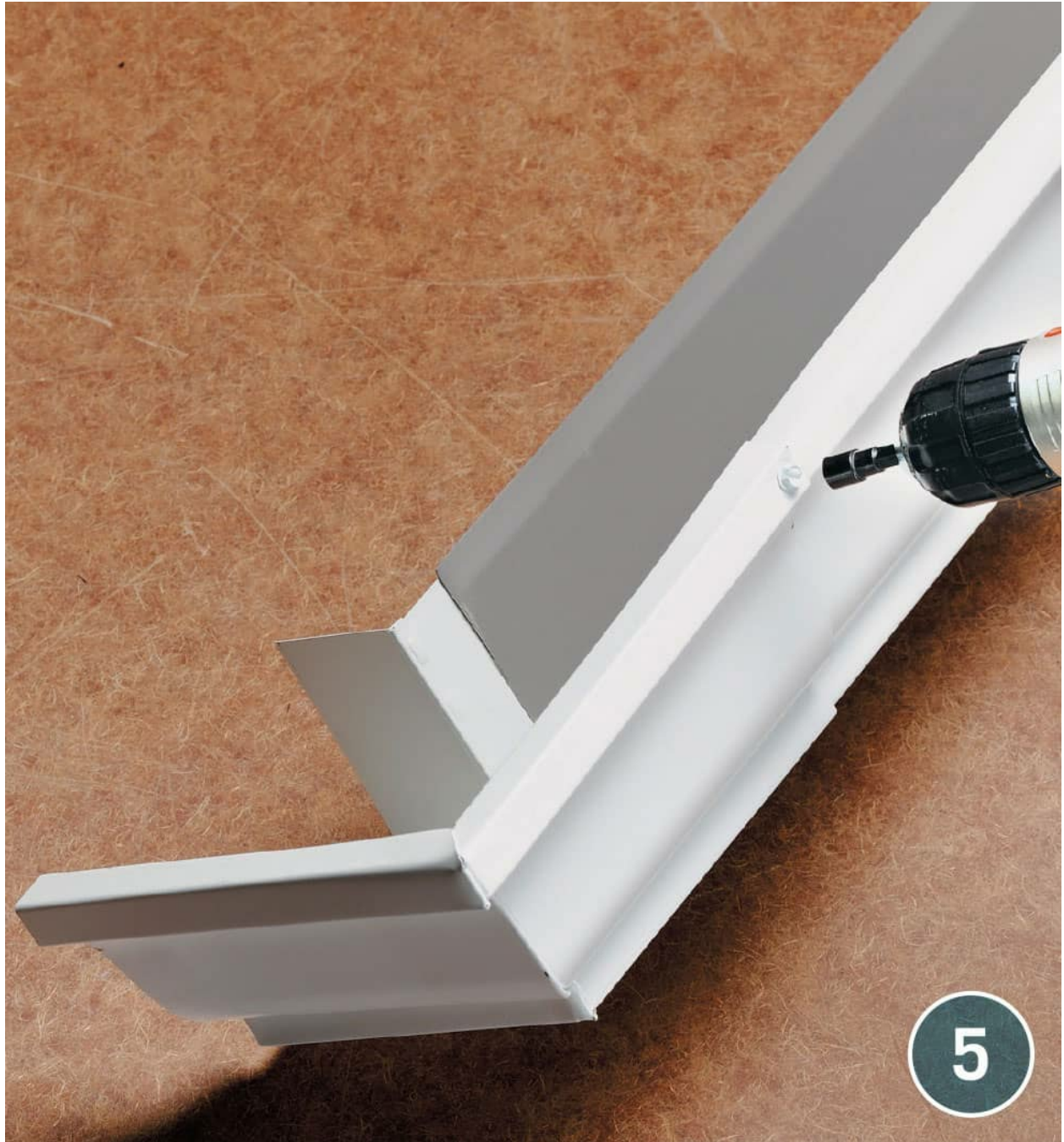


**Attach a prefabricated drop** to your section of gutter. Apply sealant, join the gutter section to the drop, and attach with zip screws or rivets, whichever the manufacturer recommends.

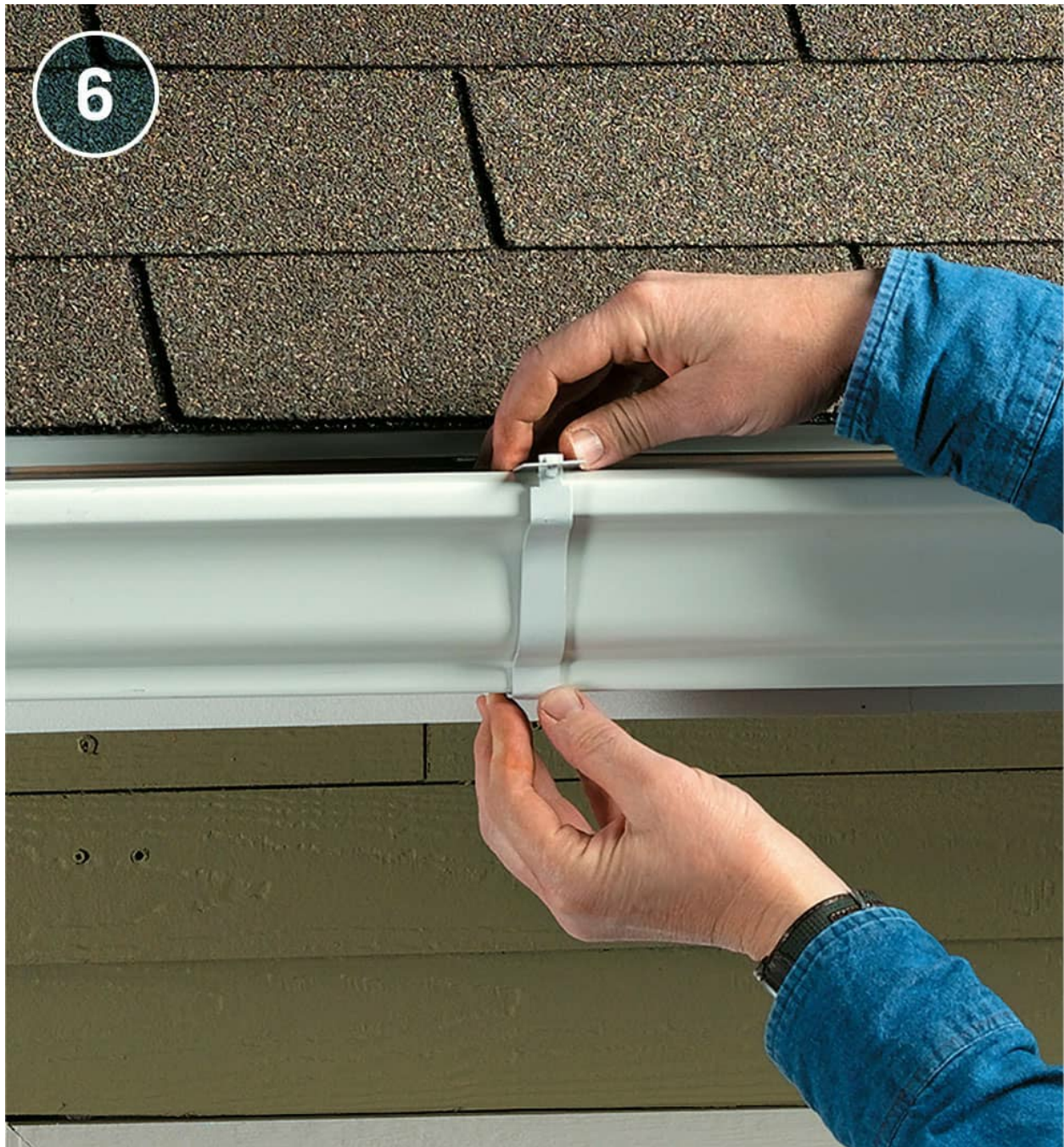


Place an end cap over the end of the gutter. Drive zip screws through the flange into the gutter. Apply ample sealant along the inside edges of the cap.





Apply a small bead of sealant on the bottom and sides inside a corner box. Slide the end of the gutter inside the box. Fasten the gutter and box together using zip screws. Apply ample sealant along the inside seam.



Clip gutter hangers to the gutter every 24". Lift the gutter into place, sliding the back side under the drip edge and aligning the bottom with the chalkline. Drive the nail or screw in each hanger through the fascia to install.





Fasten an elbow to the gutter outlet, driving a zip screw through each side. Hold another elbow in place against the house. Measure the distance between the elbows, adding 2" at each end for overlap. Cut a downspout to this length using a hacksaw. Crimp the corners of the downspout for easy insertion and fasten together.

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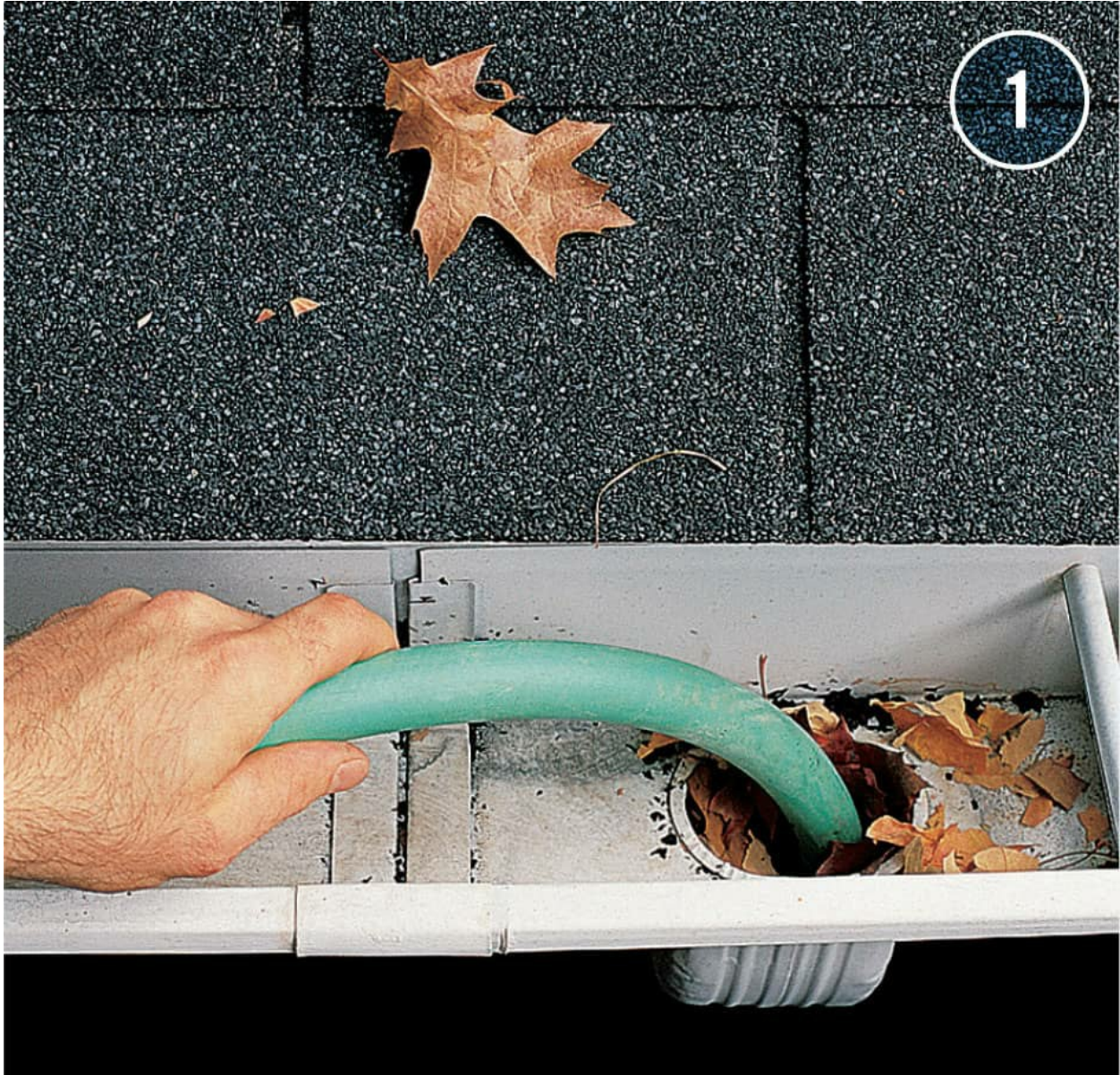
**TIP:** Assemble the elbows and downspout so the top pieces always fit inside bottom pieces.



Fasten downspout brackets to the wall for the top and bottom of the downspout and every 8' in between. Cut a downspout that spans the length of the wall, and attach it to the elbow at the top. Install another elbow at the end of the downspout. Fasten the brackets to the downspout.



## How to Unclog Gutters



Flush clogged downspouts with water. Wrap a large rag around a garden hose and insert it in the downspout opening. Arrange the rag so it fills the opening, then turn on the water full force.





Check the slope of the gutters using a level. Gutters should slope slightly toward the downspouts. Adjust the hangers, if necessary.





Place gutter guards over the gutters to prevent future clogs.



# How to Rehang Sagging Gutters & Patch Leaks



For sagging gutters, snap a chalkline on the fascia that follows the correct slope. Remove hangers in and near the sag. Lift the gutter until it's flush with the chalkline.

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**TIP:** A good slope for gutters is a  $\frac{1}{4}$ " drop every 10' toward the downspouts.





Reattach hangers every 24" and within 12" of seams. Use new hangers, if necessary. Avoid using the original nail holes. Fill small holes and seal minor leaks using gutter caulk.

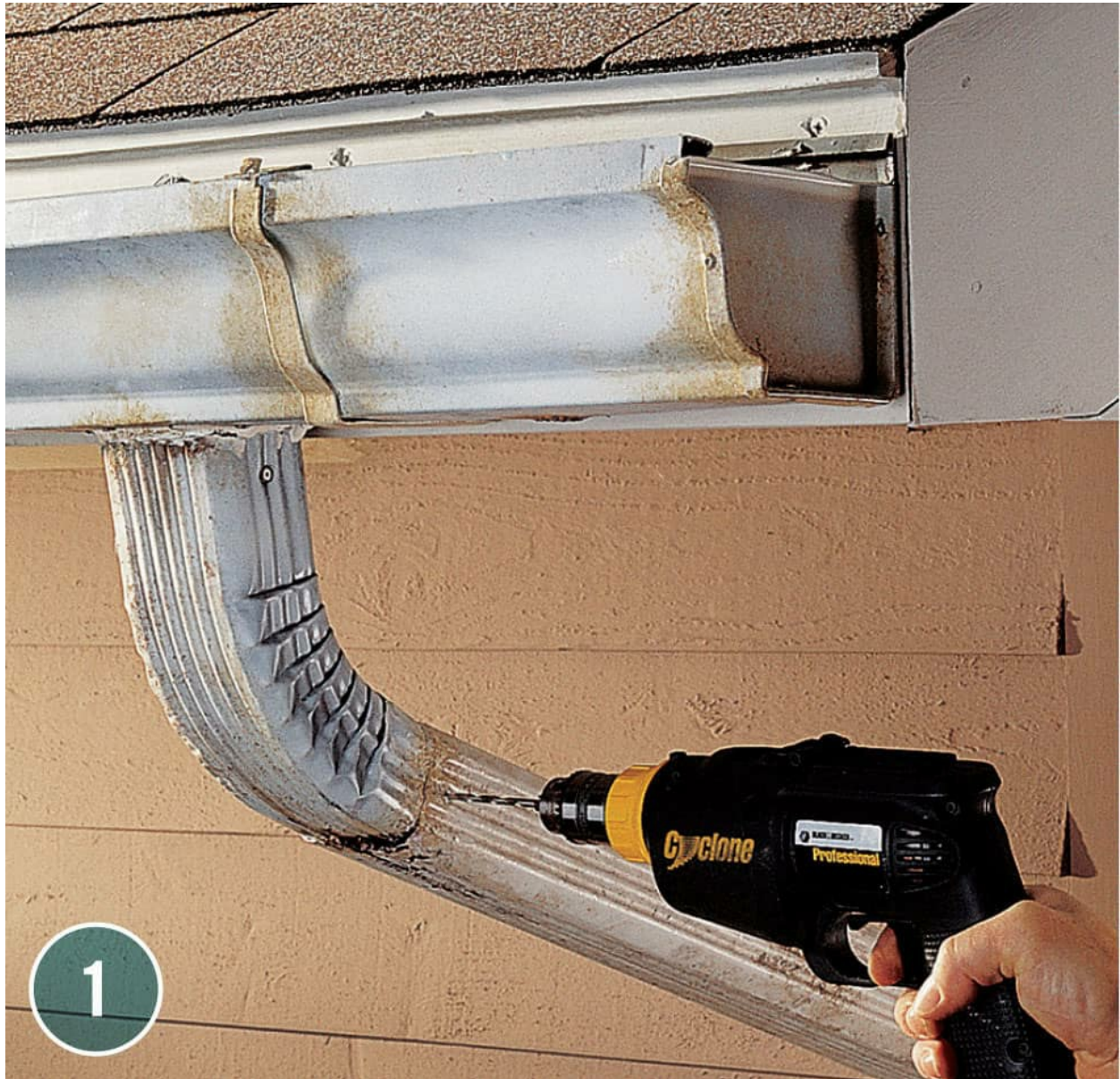




Use a gutter patching kit to make temporary repairs to a gutter with minor damage. Follow manufacturer's directions.



## How to Repair Leaky Joints



Drill out the rivets or unfasten the metal screws to disassemble the leaky joint. Scrub both parts of the joint with a stiff-bristle brush. Clean the damaged area with water, and allow to dry completely.





Apply caulk to the joining parts, then reassemble the joint. Secure the connection with pop rivets or sheet-metal screws.



## How to Patch Metal Gutters



Clean the area around the damage with a stiff-bristle brush. Scrub it with steel wool or an abrasive pad to loosen residue, then rinse it with water.



Apply a  $\frac{1}{8}$ "-thick layer of roofing cement evenly over the damage. Spread the roofing cement a few inches past the damaged area on all sides.





Cut and bend a piece of flashing to fit inside the gutter. Bed the patch in the roofing cement. Feather out the cement to reduce ridges so it won't cause significant damming.

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**TIP:** To prevent corrosion, make sure the patch is the same type of metal as the gutter.



## How to Replace a Section of Metal Gutter



Remove gutter hangers in and near the damaged area. Insert wood spacers in the gutter near each hanger before prying.



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**TIP:** If the damaged area is more than 2' long, replace the entire section with new material.



Slip spacers between the gutter and fascia near each end of the damaged area, so you won't damage the roof when cutting the gutter. Cut out the damaged section using a hacksaw.



Cut a new gutter section at least 4" longer than the damaged section.



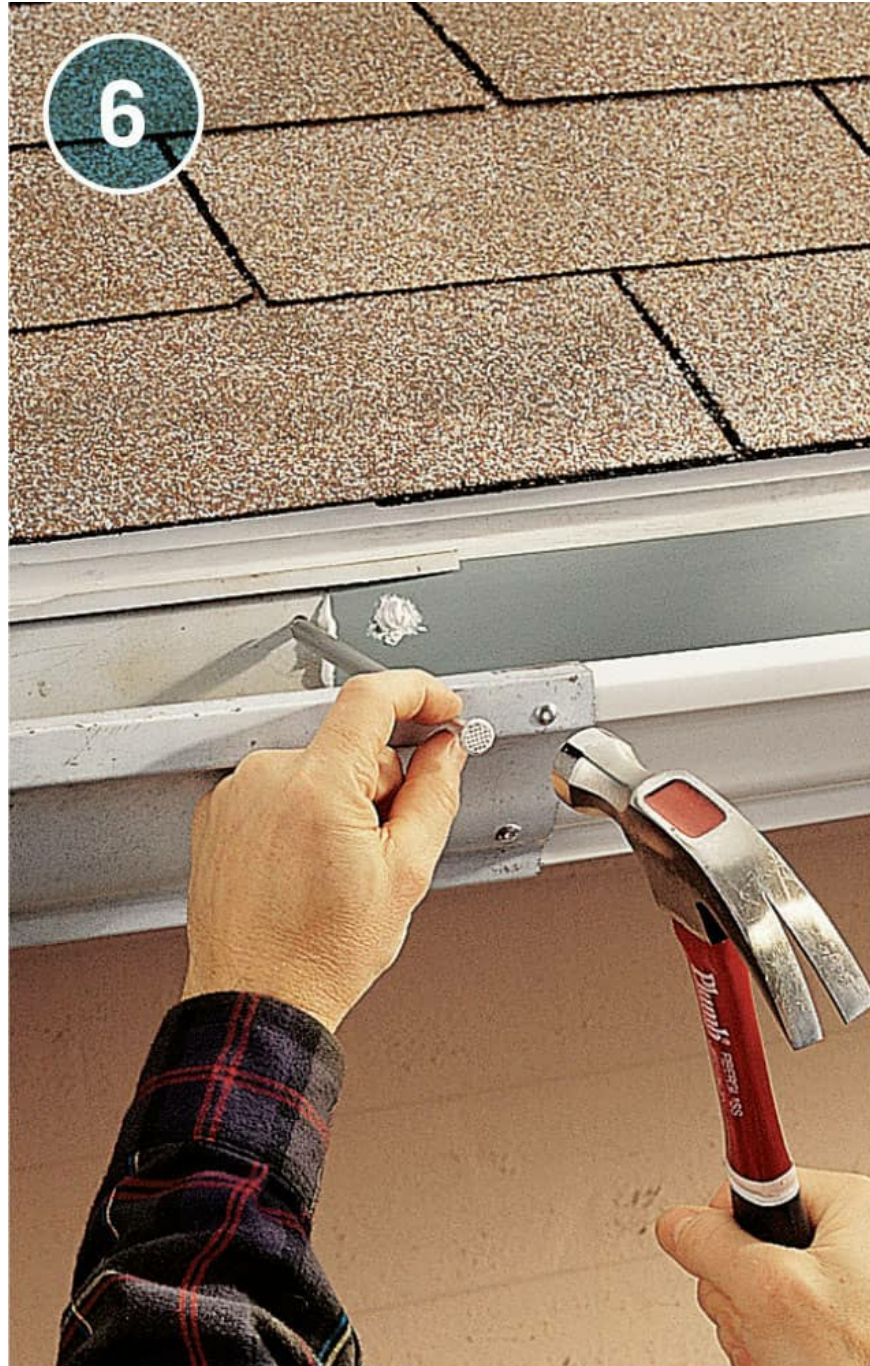


Clean the cut ends of the old gutter using a wire brush. Caulk the ends, then center the gutter patch over the cutout area and press into the caulk.



Secure the gutter patch with pop rivets or sheet-metal screws. Use at least three fasteners at each joint. On the inside surfaces of the gutter, caulk over the heads of the fasteners.





Reinstall gutter hangers. If necessary, use new hangers, but don't use old holes. Prime and paint the patch to match the existing gutter.

## How to Replace Valley Flashing

Asphalt roofing is most prone to leaking where two roof planes meet—in the valleys. Sometimes the metal valley flashing is corroded or poorly nailed, producing a leak; or if your shingles are woven over one another in a valley, there may not be any underlying metal flashing at all. As soon as the shingles start to deteriorate, a leak is bound to happen. It could also be that your current metal flashing's design is redirecting water back under the shingles during heavy rains and creating leaks. Whatever the case may be, you may need to replace the flashing or improve how it's installed. If the current shingles are in good condition, you can do this project without replacing your entire roof.

The process for replacing valley flashing involves four main stages. First, you'll carefully remove the shingles in the valley area so they can be reinstalled over the new flashing later. Second, self-adhesive underlayment membrane is rolled onto the roof deck to provide a barrier beneath the metal flashing. This step ensures that roofing felt isn't your roof's only line of defense if the metal leaks in the future. Third, you'll install new W-style aluminum valley flashing, which will never corrode. Finally, the original shingles are laced back into place over the flashing and cut back to leave the flashing area partially exposed.



### TOOLS & MATERIALS

- Pry bar
- Push broom
- Hook-bladed utility knife
- Measuring tape



Straightedge  
Hammer  
Aviation snips  
Metal seamer  
Chalkline  
Self-adhesive underlayment membrane  
Aluminum W-style valley flashing  
Roofing nails



**Damaged valley flashing** can be patched for temporary leak stoppage, but you should replace it completely as soon as you can.

## How to Replace Damaged Valley Flashing



Carefully lift shingles in the valley area with a prybar to break their self-seal strip, and pry the nails free. Shingles are generally held in place with eight nails —four from the shingle above and four above the tabs. Slide the shingles out and stack them in order so they'll be easier to replace later. Remove enough shingles to completely expose the valley flashing.



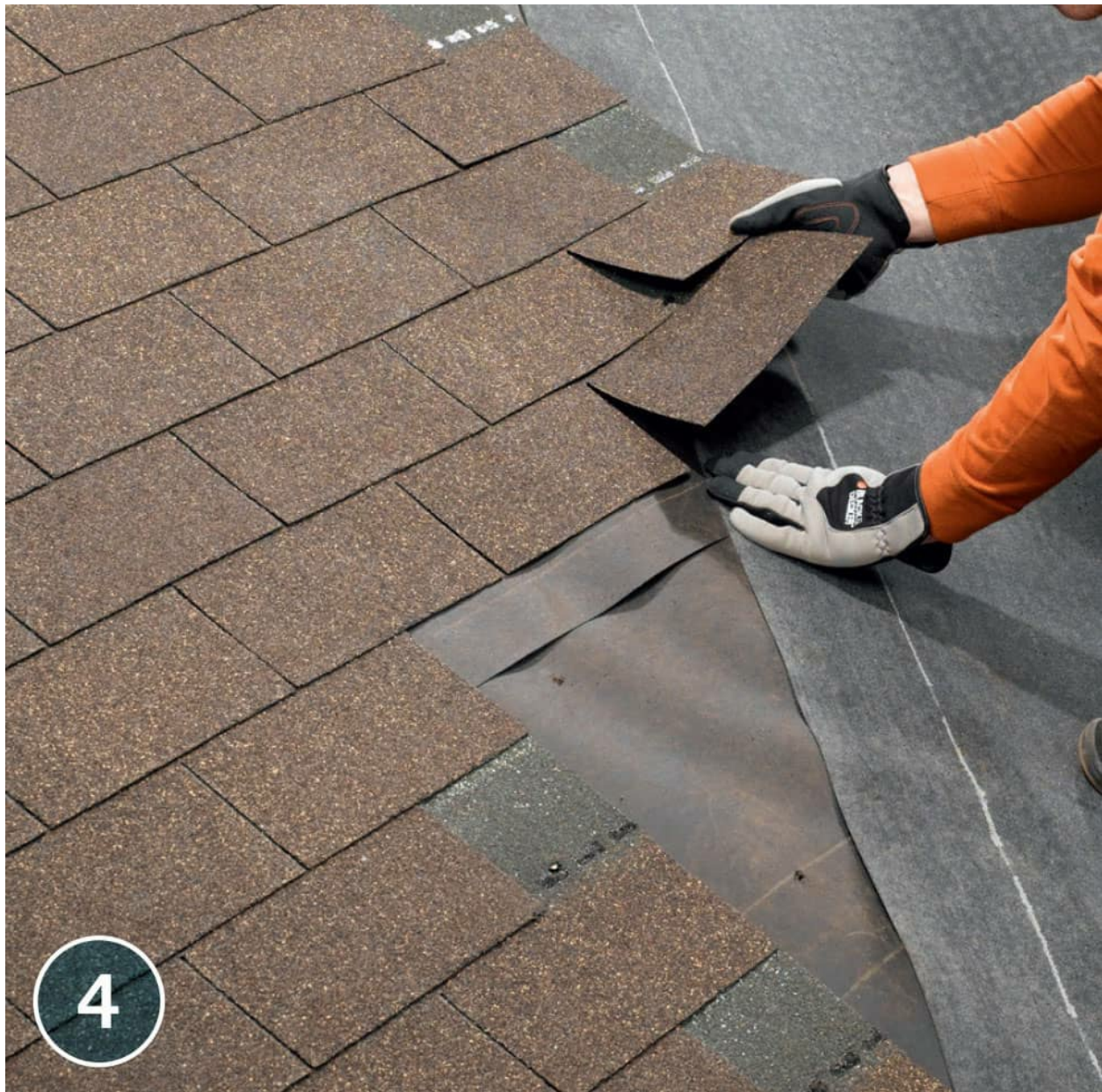


**Pry off the old flashing and remove all nails. Sweep the valley area thoroughly, clearing off all of the debris on the roof deck. Inspect the roofing felt and decking surfaces. If the felt is torn or the decking is deteriorated from moisture, replace it now. (For more on replacing sheathing, see [here](#).)**



Roll out the self-adhesive underlayment membrane from the ridge to the eave with the paper backing facing down. You can use granulated or bare membrane for this application. Cut the membrane off the roll so it overlaps the eave and ridge.





Starting at the ridge, peel off the backing paper to expose the adhesive and stick the membrane down on the roofing felt. You may find it helpful to tack the membrane at the ridge to anchor it. Slip the membrane under any overhanging shingles as you proceed, and keep the membrane as flat and smooth as possible. It must make full contact with the deck and not be gapped at the base of the valley, or it could tear and breach the seal.



Set the first piece of valley flashing in place so it overlaps the eave. Use a straightedge to mark cutting lines on the flashing that match the angles of the roof decks. The goal here is to cut the flashing about 1" longer than the end of the roof so you can lap the flashing over the drip edge. It will prevent ice dams from forming here in the winter.



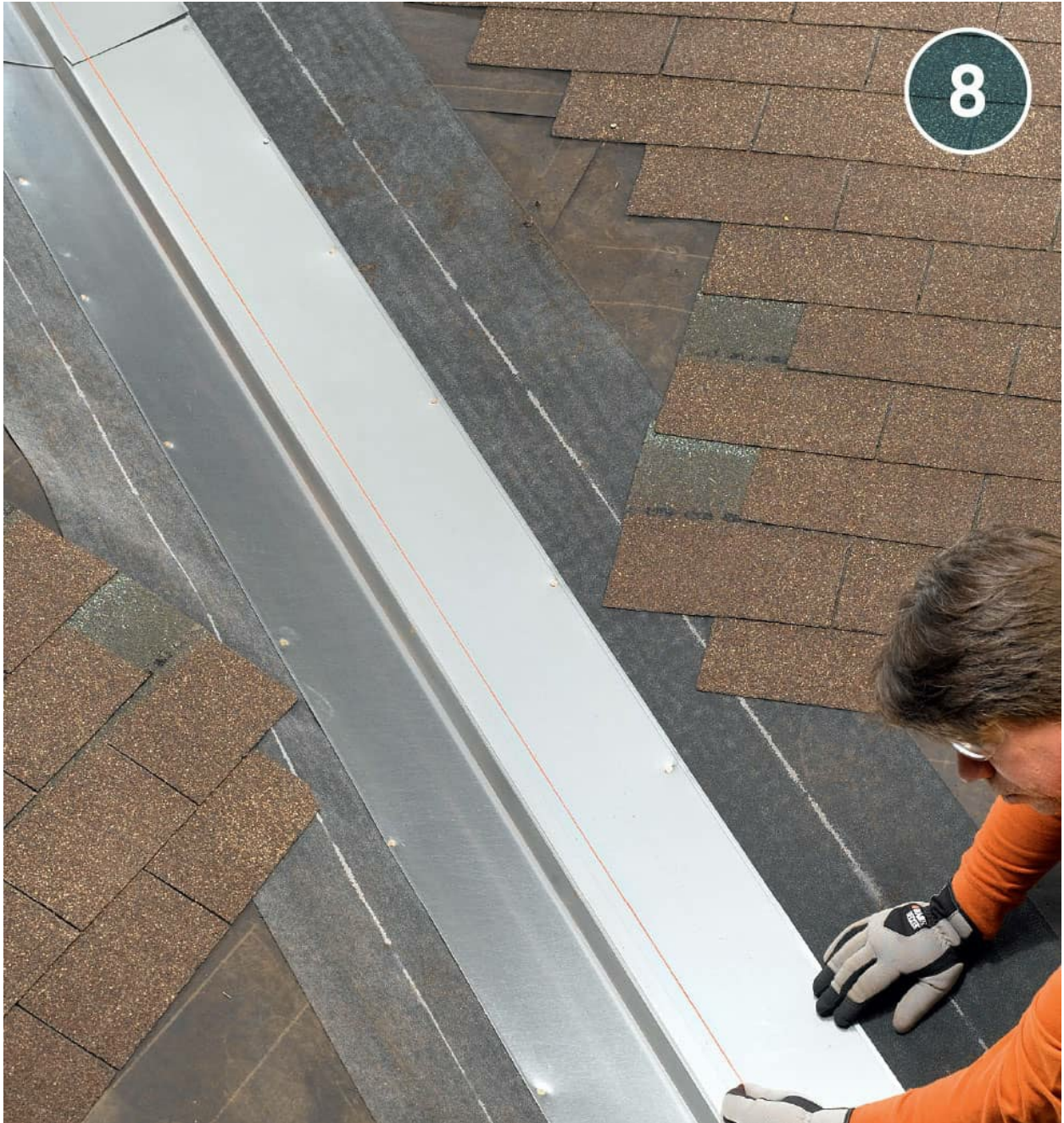


Use a metal seamer to bend the flashing overlaps down over the drip edge. Cut tabs in the notched area of the flashing and fold them over the raised ridge to close this gap.



Position the eave flashing carefully, and nail it in place with  $\frac{7}{8}$ " roofing nails spaced every 12" up the flashing. Drive the nails within 1" of the edge of the flashing only.





**When the first strip of flashing is completely nailed, set the second strip in place on the roof deck so it overlaps the first by 1'. With assistance, stretch a chalkline from the eave to the ridge to make sure both flashings form a straight line along the center ridge. Make any adjustments to the fit, and proceed to nail the second strip to the deck. Continue to install flashing up to the ridge, and cut off the overhang with aviation snips.**





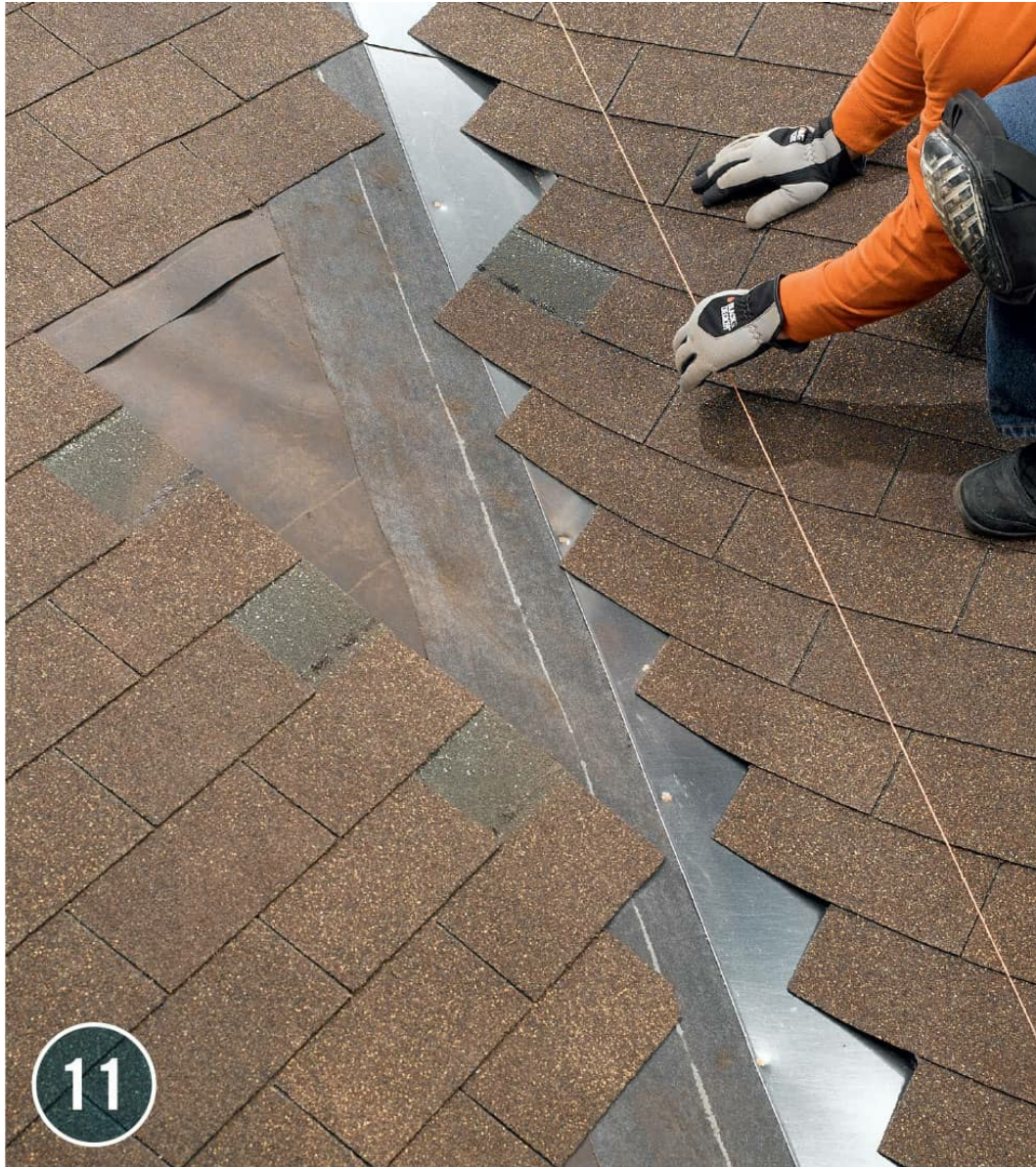
Slip the shingles back into position along one edge of the flashing from eave to ridge. Renail the shingles to the roof deck using the same nailing pattern as you would when installing them new.





Carefully lift the overlapping shingle edges, and nail the shingles to the valley flashing within 1" of its edge.





With an assistant's help, snap a chalkline from the ridge to the eave to mark a trim line on the overlapping shingles. Position this line so about 3" of the flashing next to the flashing ridge will be exposed at the roof ridge and about 6" will be exposed at the eave. The wider exposure of flashing at the bottom will help handle the greater volume of water here without overflowing the flashing.





Trim off the overhanging portion of each shingle along the chalkline to complete the first side of the flashing detail. Then repeat the process of refitting, nailing, marking, and trimming shingles on the other side of the flashing to finish the valley. Slip a scrap of wood behind the shingles to protect the flashing when trimming the shingles.



# How to Replace Step Flashing



Carefully bend up the counter flashing or the siding covering the damaged flashing. Cut any roofing cement seals, and pull back the shingles. Use a flat pry bar to remove the damaged flashing.

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**TIP:** When replacing flashing around masonry, such as a chimney, use copper or galvanized steel. Lime from mortar can corrode aluminum.





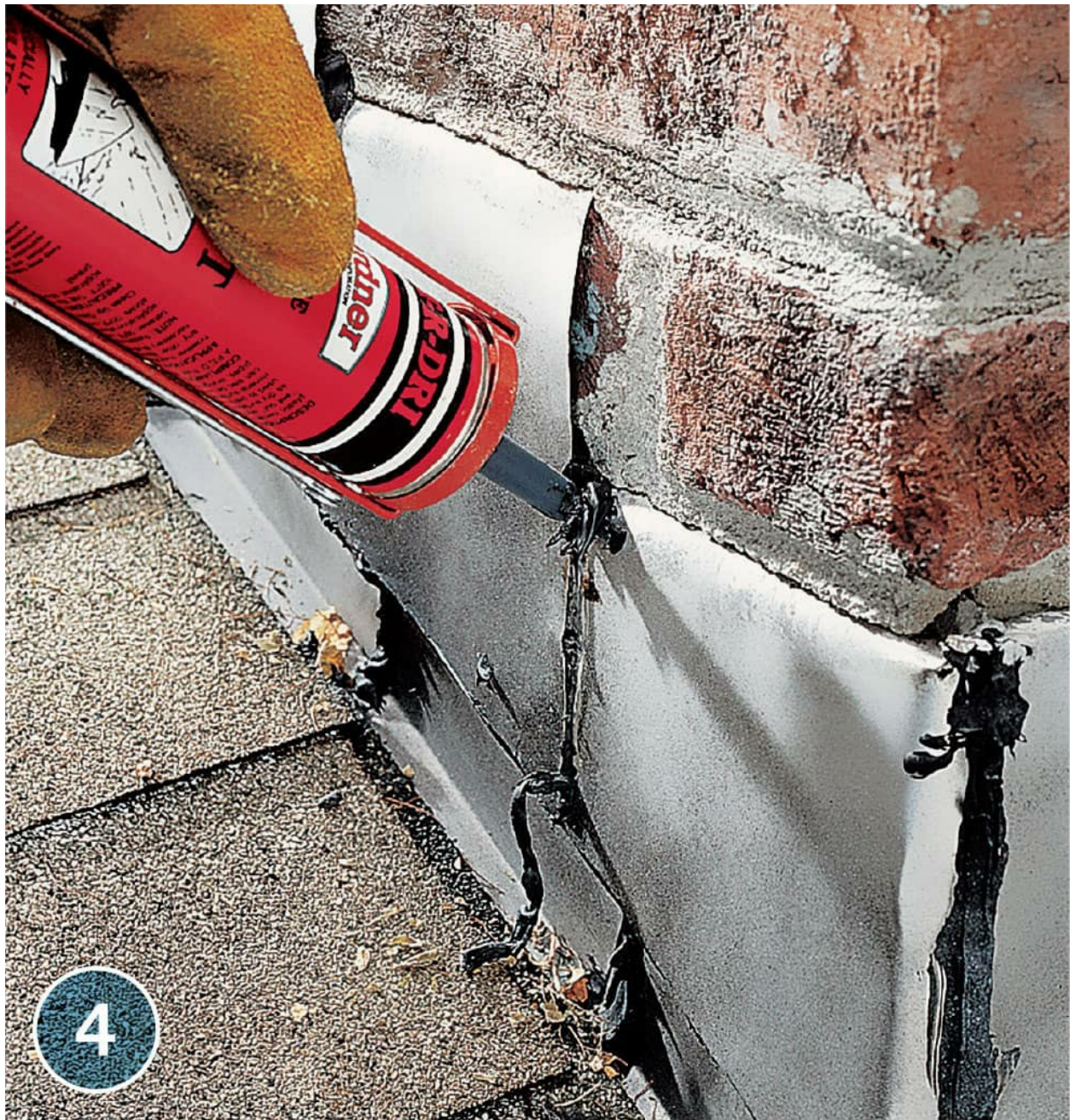
Cut the new flashing to fit, and apply roofing cement to all unexposed edges. Slip the flashing in place, making sure it's overlapped by the flashing above and overlaps the flashing and shingle below.





Drive one roofing nail through the flashing, at the bottom corner, and into the roof deck. Do not fasten the flashing to the vertical roof element, such as a chimney.





Reposition the shingles and counter flashing, and seal all joints with roofing cement.



# Resources

**Alside**

800-922-6009

[www.alside.com](http://www.alside.com)

**American Building Components**

800-877-8709

[www.abcmetalroofing.com](http://www.abcmetalroofing.com)

**Black+Decker**

[www.blackanddecker.com](http://www.blackanddecker.com)

**Boral Roofing**

800-669-8453

[www.boralamerica.com/roofing](http://www.boralamerica.com/roofing)

**Brava Roof Tile**

844-290-4196

[www.bravarooftile.com](http://www.bravarooftile.com)

**CertainTeed**

800-782-8777

[www.certainteed.com](http://www.certainteed.com)

**DaVinci Roofscapes**

800-328-4624

[www.davinciroofscapes.com](http://www.davinciroofscapes.com)

**Eagle Roofing Products**

888-TILE-ROOF (888-8453-7663)

[www.eagleroofing.com](http://www.eagleroofing.com)

**GAF Materials Corporation**

[www.gaf.com](http://www.gaf.com)

**GenTite**

877-436-8483

[www.gentite.com](http://www.gentite.com)

**Interlock Lifetime Roofing Systems**

866-733-5811

[www.interlockroofing.com](http://www.interlockroofing.com)

**MCA Clay Roof Tile**



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page [16](#)

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pages [44](#), [46](#), [106](#) (top)

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pages [13](#) (top), [21](#)

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pages [10](#), [22](#), [26](#) (lower right)

**DaVinci Roofscapes**

pages [13](#) (bottom), [79](#)

**[Dreamstime.com](#)**

page [56](#)

**GAF Materials, Corp.**

pages [8](#), [12](#), [19](#), [42](#), [62](#)

**Gentite**

pages [18](#), [68](#)

**Interlock**

page [23](#) (top, both)

**Rooflite**

page [25](#)

**Scot Zimmerman**

page [108](#) (lower right)

**US Tile**

pages [20](#), [85](#), [89](#)





# Index

adhesive bonding, [69](#)  
air compressor, [36](#)  
air guns, [29](#)  
aluminum fascia, [106](#)  
aluminum roll flashing, [98](#)  
aluminum roofing nails, [37](#)  
aluminum soffits, [102](#)  
apron flashing, [60](#)  
architectural shingles, [12](#), [15](#), [16](#)  
asphalt roll roofing, [17](#)  
asphalt shingles  
    about, [46](#)  
    installing, [47](#)  
    replacing, [94](#)  
asphalt three-tab shingles, [14](#), [47](#)  
aviation snips, [37](#)  
  
base flashing, [35](#), [51](#)  
bending flashing, [99](#)  
bent step flashing, [98](#)  
body harness, [31](#)  
bonding adhesive, [69](#)  
building paper, [37](#), [42](#)  
butyl mastic tape, [74](#)  
  
caulk and caulk gun, [36](#), [69](#)  
cedar shakes, [56](#), [95](#)  
ceiling stains, [11](#)  
chalkline, [36](#)

- chimney cap, [35](#)
- clay tile, [20](#), [84](#)
- concealed nail application for roll roofing, [65](#)
- concrete tile, [21](#)
- continuous ridge vents, [54](#), [101](#)
- continuous soffit vents, [101](#)
- conversion chart, for slope, [26](#)
- copper roll flashing, [98](#)
- cordless drill/driver, [36](#)
- cornice covers, [110](#)
- corrugated nonmetallic panels, [23](#)
- costs
  - comparison of, [12](#)
  - estimating, [12](#)
- counter flashing, [35](#), [51](#), [87](#)
- cutting clay tile, [84](#)
  
- dormer vents, [101](#)
- double coverage application for roll roofing, [65](#)
- drip cap molding, [98](#)
- drip edge, [37](#), [44](#), [73](#)
- drip-edge molding, [44](#)
- dumpsters, [38](#)
- durability, [13](#)
  
- emergency repairs, [93](#)
- environmentally friendly roofs, [24](#)
- EPDM adhesive and primer, [69](#)
- EPDM membrane, [69](#)
- EPDM rubber roofing, [18](#), [68](#)
- estimating roofing, [26](#)
- estimating time requirements, [27](#)
- evaluating needs, [10](#)
- extension ladders, [29](#)
- exterior screws, [69](#)



- fall-arresting gear, [31](#)
- fascia, [34](#), [97](#), [100](#), [106](#), [110](#)
- fascia headers, [110](#)
- fasteners, [37](#)
- faux slate, [78](#)
- felt paper, [42](#)
- fiber cement, [21](#)
- flashing about, [97](#), [98](#)
  - apron, [60](#)
  - base, [35](#), [51](#)
  - bending, [99](#)
  - bent step, [98](#)
  - counter, [35](#), [51](#), [87](#)
  - damaged or deteriorated, [11](#)
  - diagram of, [34](#)
  - drip edge, [43](#)
  - installing valley, [99](#)
  - loose, [11](#)
  - metal roofing and, [73](#), [76](#)
  - removing, [39](#)
  - replacing, [121](#)
  - shingle installation and, [49](#)
  - tile roofing and, [88](#)
  - types of, [37](#)
- flat pry bar, [36](#)
- flexible step molding, [98](#)
- fly hooks, [30](#)
- framing square, [36](#)
  
- gable vents, [101](#)
- galvanized roofing nails, [37](#)
- GFCI extension cords, [29](#)
- gutters
  - about, [97](#)

- diagram of, [35](#)
- metal, [115](#), [119](#)
- parts of, [112](#), [115](#)
- patching leaks in, [118](#)
- patching metal, [119](#)
- rehanging sagging, [118](#)
- replacing section of, [120](#)
- unclogging, [118](#)
- vinyl, [112](#)

- hammer stapler, [36](#)
- handy flashing, [98](#)
- high-density fiberboard, [69](#)
- hip ridges, [83](#)
- hose clamps, [69](#)

- ice and water shield, [37](#), [42](#)
- ice dams, [90](#)
- inspecting and repairing roofs, [90](#)
- insulation baffles, [100](#)
- insulation plates, [69](#)

- J-roller, [69](#)
- ladder jacks, [30](#)
- ladders, [28](#)
- lanyard, [31](#)
- leaks, locating and evaluating, [92](#)
- ledger boards, [110](#)
- lifeline, [31](#)
- lifting shingles, [32](#)
- living roofs, [25](#)
- lumbar support brace, [32](#)

- materials choosing, [10](#), [12](#)
  - color of, [10](#)



- description of, [36](#)
- measuring and planning, [27](#)
- mechanical rope grab, [31](#)
- metal ridge anchor, [31](#)
- metal roofing, [22](#), [72](#)
- metal shingles, [23](#)
- mortar, [84](#)
  
- nailers, [36](#), [86](#)
- nails, [37](#)
  
- performed valley flashing, [37](#)
- perimeter bond, roll roofing in, [63](#)
- photovoltaic shingles, [25](#)
- pipe boots, [69](#)
- pneumatic nailer, [36](#)
- power cables, [29](#)
- problems, identifying, [11](#)
  
- rafter lookouts, [103](#), [110](#)
- raised seam metal roofing, [72](#)
- rake edge, [34](#), [86](#)
- rake flashing, [76](#)
- repairing wood fascia and soffits, [110](#)
- repairs
  - emergency, [93](#)
  - spot, [93](#)
- ridge
  - diagram of, [35](#)
  - faux slate and, [83](#)
  - metal roofing and, [77](#)
  - sagging, [91](#)
- ridge cap
  - asphalt shingles and, [52](#), [55](#)
  - cedar shakes and, [61](#)

- removing, [39](#)
- ridge tiles, [88](#)
- ridge vents, [54](#), [101](#)
- robe-grab mechanism, [31](#)
- roll flashing, [98](#)
- roll roofing, [62](#)
- rolled flashing, [37](#)
- roof jacks, [33](#), [36](#)
- roof pitch, [13](#)
- roof sheathing, [100](#)
- roof systems, [34](#)
- roof vents, [34](#), [88](#), [100](#), [101](#)
- roofing
  - about, [9](#)
  - calculating area of, [26](#)
  - choosing, [12](#)
  - common problems with, [91](#)
  - estimating, [26](#)
  - evaluating needs for, [10](#)
  - identifying problems with, [11](#), [90](#)
- roofing cement, [37](#), [93](#)
- roofing hammer, [36](#)
- roofing ladder, [36](#)
- roofing nail coil, [37](#)
- roofing shovel, [36](#)
- rubber gasket nails, [37](#)
- rubber membrane roofing, [18](#)
- rubber pipe boots, [69](#)
- safety, [9](#), [28](#)
- seaming tape, [69](#)
- self-adhesive application for roll roofing, [66](#)
- shadow-line shingles, [15](#)
- sheathing, replacing, [40](#)



- shingles
  - about, [49](#)
  - architectural, [12](#), [15](#), [16](#)
  - asphalt three-tab, [14](#)
  - asphalt types, [15](#)
  - damaged or deteriorated, [91](#)
  - identifying problems with, [11](#)
  - installing, [49](#)
  - laminated asphalt, [16](#)
  - lifting and staging, [32](#)
  - metal, [23](#)
  - photovoltaic, [25](#)
  - replacing, [94](#)
  - slate, [19](#)
- side wall flashing, [76](#)
- skylight flashing, [37](#), [60](#)
- slate shingles, [19](#)
- slope
  - calculating, [27](#)
  - conversion chart for, [26](#)
  - measuring, [27](#)
- soffit molding, [110](#)
- soffit panels, [35](#), [100](#), [101](#), [110](#)
- soffit vents, [34](#), [100](#), [101](#)
- soffits
  - about, [97](#), [100](#)
  - aluminum, [102](#)
  - diagram of, [34](#)
  - repairing wood, [111](#)
  - wood, [108](#), [111](#)
- speed square, [36](#)
- spot repairs, [93](#)
- staging shingles, [32](#)
- stakes, for ladders, [30](#)

standing-seam metal roofs, [22](#)  
step flashing, [37](#), [51](#), [98](#), [125](#)  
straight edge, [36](#)

tape measure, [36](#)  
tar paper, [42](#)  
tear off, completing, [38](#)  
termination bars, [69](#)  
tile roofing, [84](#)  
time requirements, estimating, [27](#)  
tools and materials, [36](#)

underlayment, [42](#), [86](#)  
utility knife, [36](#)

valley flashing, [35](#), [37](#), [73](#), [98](#), [99](#), [121](#)  
vent pipe flashing, [37](#), [49](#)  
vent pipes, [64](#)  
vent stack boot, [75](#)  
vented soffit panels, [101](#)  
vents  
    about, [97](#), [100](#)  
    diagram of, [34](#)  
    types of, [101](#)

wood shakes and shingles  
    about, [56](#)  
    installing, [58](#)  
    replacing, [95](#)  
    underlayment for, [57](#)  
wood soffits, [108](#)





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